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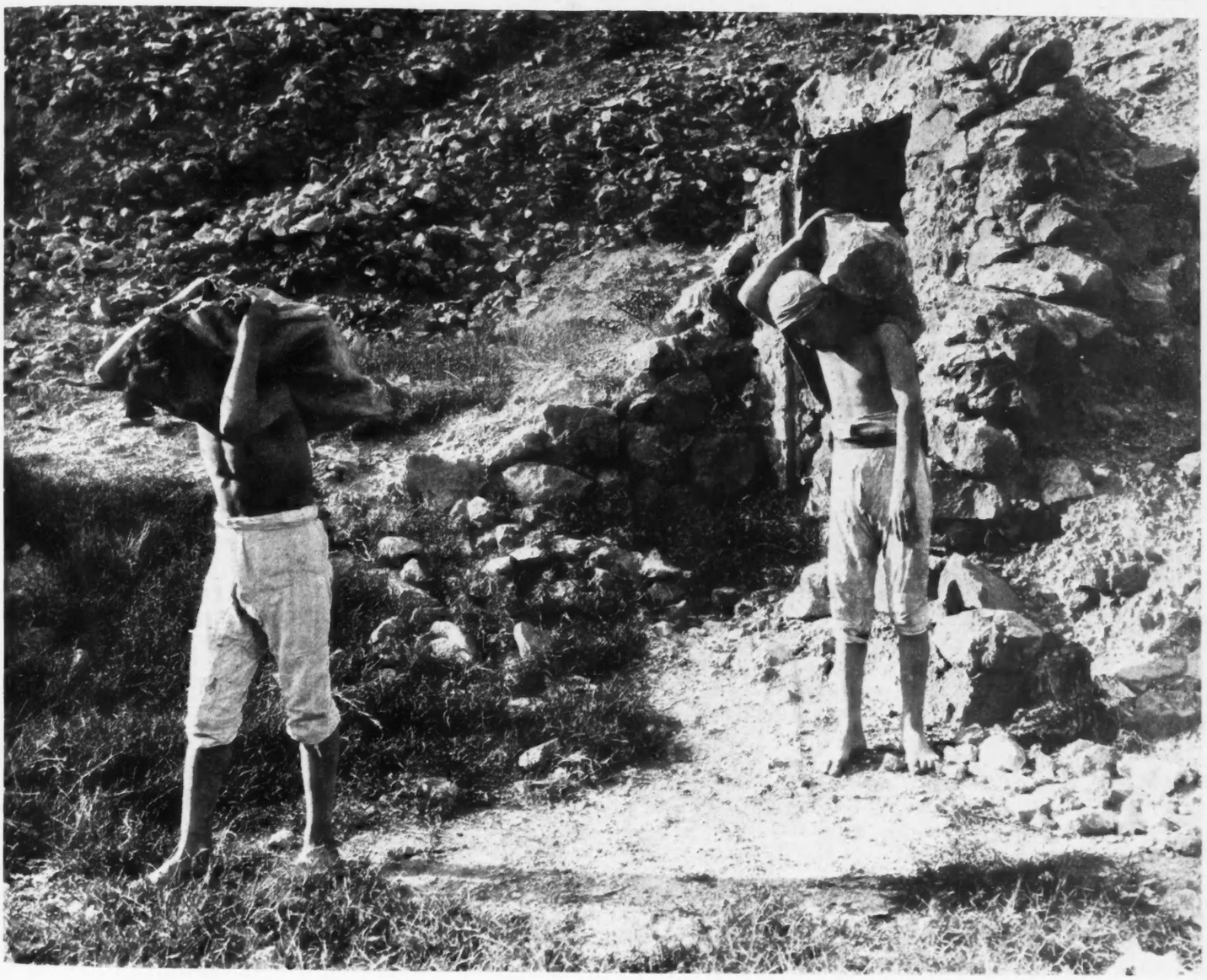


Photo by Ewing Galloway

BOY LABORERS AT A SULPHUR MINE IN SICILY

With work of the type shown being done by boys for a pay of 80 cents per week and with a [illegible]

The Rejuvenation of Nevada Consolidated

By Arthur Barrette Parsons

Detonators for Shooting Oil Wells

Past and Present

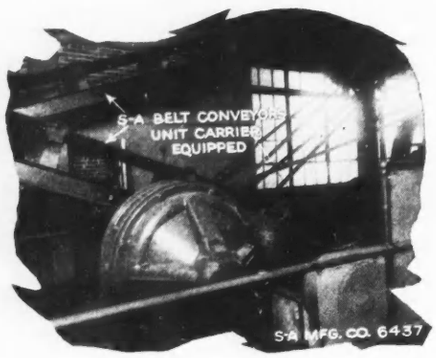
By James Calhoun

Marble Quarrying at Sonora, California

A Pictorial Story

Ore sampling too—requires S-A equipment

from "The Labor Saver"



In the design and construction of the new plant of the Utah Ore Sampling Co., at Murray, Utah, an effort has been made to incorporate such improvements in the mechanical arrangements of the plant as have been suggested by years of experience.

This new mill has a rated capacity of 100 tons per hour and contains the latest improved equipment in its crushing, conveying and power transmission arrangement.

Ore arriving by rail from the mines in carload lots is dropped into a steel track hopper of sufficient capacity to hold a maximum carload. The empty car is thoroughly swept and cleaned with compressed air and rolled forward to the track scales under the reloading bin, weighed and prepared to receive the original load of ore after it has passed thru the mill for sample.

From the track hopper the ore passes on to a 30-in. steel pan conveyor (illustration No. 6436) running at a speed of 30 ft. per minute, controlled by a friction clutch, discharging onto a shaking grizzly. The oversize lumps are fed by this grizzly into a 15-in. x 24-in. jaw crusher running at 300 r.p.m. and set to crush to 3 in. or finer. The product of the crusher joins the under-size from the grizzly in a hopper feeding a 24-in. belt conveyor (illustration No. 6437) and passes by way of a shaking plate conveyor to a set of 54-in. x 16-in. crushing rolls set to crush to minus 1½ in.

All of the ore is then raised by a second 24-in. belt conveyor (illustration No. 6437) to a small hopper from which it passes thru an 8-in. rectangular opening into the first cutter. From this cutter 80% of the ore goes directly into the boot of the reject elevator and is raised to the reloading bin and 20% retained as sample passes by way of a shaking pan feeder into a set of 36-in. x 16-in. rolls which crush it to minus ¾ in. Raised again on a 14-in. belt conveyor (illustration No. 6439) this product passes a 6-in. cutter. The 80% reject by this cutter flows thru a chute to a 16-in. belt conveyor running horizontally just below the floor level under the last three sets of rolls, which carries these rejects to the elevator boot.

The sample now reduced to minus ⅜ in. and in quantity to 4% of the original ore stream, is raised twice more, subdivided and crushed, passing thru two 5-in. cutters, a set of 24-in. x 12-in. rolls and a set of 18-in. x 10-in. rolls before being collected in a steel sample buggy enclosed in a dust-tight steel safe under the last set of rolls.

It will be seen from the above that the operation is entirely automatic from the time the ore is dumped from the car until the sample is received in the sample safe.

The use of a shaking pan feeder for receiving the sample from each cutter and discharging it into the next set of rolls, together with the use of belt conveyors rather than bucket elevators for handling the sample, combine to give a steady flow of well-mixed ore thru each cutter, thus conducing to accuracy of results.

The sizes of ore as shown for each set of rolls are the maximum allowed for ore of ordinary value and characteristics. For high-grade special ores the rolls are set up to give smaller size.

All of the cutters are designed to take a 20% sample, the 8-in. cutter makes 40 cuts per minute. The 6-in. cutter makes 42 cuts per minute and the 5-in. cutters 44 cuts per minute.

This plant differs from the earlier types of sampling mills in that all of the crushing units are on one general floor level, that belt conveyors are used instead of bucket elevators and in a new type of sampling machine designed by the company's engineers. The mill proper consists of a one-story building 22 ft. wide by 212 ft. long, by 14 ft. high from main floor to ceiling. The building is constructed of reinforced concrete, columns and beams with brick curtain walls and large steel sash, which makes an unusually light mill.

For handling sample ore it is believed that belt conveyors have a great advantage over bucket elevators or long crooked chutes because they can be cleaned easily and present no pockets or inaccessible places where ore might lodge.

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JOSIAH EDWARD SPURR, Editor

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The Lead Scarcity

OUR READERS will find much of interest in the remarks that were made at a meeting of the Mining and Metallurgical Society in New York last week, devoted to "Lead—the Precious Metal," a report of the meeting appearing in this issue. In a two-hour discussion it was obviously impossible to touch on all of the important features of the lead situation, so perhaps a few additional words here may not be amiss.

The present price of lead is, of course, high, whether measured in terms of a standard gold dollar or a depreciated gold dollar. The average price of the metal in 1912-13-14 was 4¼c. and the average for 1925 will be about 9c. Assuming that the 1913 dollar has this year been worth only 60c., an equivalent price for lead would have been 7c. Price, generally speaking, is governed by supply and demand. In the case of lead, the high price has been caused by a limited supply rather than by an unusual demand, a condition that we do not think was sufficiently emphasized at the meeting. In 1924, the world's consumption of lead was only 90,000 metric tons greater than in 1914—less than an 8 per cent increase, the percentage increase being less than that of zinc and much less than that of copper. Therefore, in spite of the greatly increased demand for lead for storage batteries and for cable covering, the total demand for lead is and has been nothing unusual. It is the difficulty of making even a moderate increase in the supply that is affecting the price.

Though the 1924 price was more than double the 1914 price, United States production from domestic ores increased only 50,000 tons, or less than 10 per cent. Canada, Mexico, and India made enormous percentage increases in that period, but the production last year of those countries was only 22 per cent of the world's total, and it does not seem likely that they can make further important increases in the near future. Spain produced less in 1924 than in 1914, and Europe generally seems to be becoming of decreasing importance as a lead producer. Australia has not been able to increase production to any great extent. An important increase in the supply of lead from present producing fields would seem to be a difficult matter, and, as was pointed out at the meeting, large potential sources of supply, awaiting development, are virtually unknown. The recent history of lead production has been quite unlike that of copper in this respect. The price of lead promises to continue high, therefore, because it has been not been brought about by an inflated demand, which might suddenly decline, but by restricted production, even at the high prices.

Two or three other aspects of the situation are worth mentioning. The development of selective flotation, for instance, makes the mining and reduction of many lead-zinc and lead-zinc-copper ores possible that were formerly not adapted to economical treatment. Here, also, the rise in the prices of zinc and silver, and to a less extent copper, will tend to increase the production of lead from complex ores.

The tariff question was carefully avoided, but some users of lead are wondering why the domestic lead producer needs protection to the extent of 2⅛c. a pound when lead is selling for 9½c. Would not a sliding tariff, affording maximum protection when the price is low, be advisable? It is worth mention here that domestic lead sellers have not been taking full advantage of the tariff. With lead at £39 per long ton in London, the equivalent New York price is about 8½c. If full advantage of the tariff differential were taken, producers here could ask 8½ plus 2⅛, or 10⅝c., without fearing any increase in the supply from foreign sources except a small amount that would be imported in the form of ore, which takes a lower rate of duty. The dominant interests, which, of course are the St. Joseph Lead Co. and the American Smelting & Refining Co., have shown a commendable restraint in advancing prices, feeling that extortionate prices will result in instability of the market and in turning customers more to the use of substitutes.

Mining Arsenic

THE MARKETING PROBLEM of the miner is well illustrated by the severe fluctuations in the demand and price for arsenic during the last year or two. The net lesson is that arsenic has sustained its record as a metal which the miner cannot count on, and which it is safe to produce only as a side issue or a byproduct. There is an innate tendency to rush into the production of a certain commodity—be it tulips or arsenic—where there is a great demand and where everybody who can produce is making money. Actually, this is like buying stocks at the height of a bull market like that which exists at present. The demand for arsenic has always been a spasmodic one, easily glutted or easily withdrawn. Our London letter of a recent date mentions the case of the South American Gold Areas Company at Sao Bento, in Brazil, which mines arsenical gold ores, and which was newly financed some little time ago upon the expectation that the demand and price of arsenic would continue. At that time the price of arsenic was about £68 per ton. Now the price has fallen to a fourth of this figure, withdrawing one of the props from under this enterprise.

The major use of arsenic (as arsenious oxide) is as an insecticide, and a recent incursion of the boll weevil in the South, threatening to ruin Southern cotton crops for all time, created for a time an intensive demand, so that all available sources were tapped and the price rose beyond all precedent. But insects rise and fall, like empires. They are governed by various safety balances, like climate and their own parasites. So it happens that this year the boll weevil has harmed the cotton crop very little, and the planters have slight

need of insecticide. The result is that arsenic production has been cut in half, while stocks and imports have remained about stationary. Since last spring prices have decreased 40 per cent.

The net lesson is that an industry whose market depends on the rise and fall of insects should be maintained, as above stated, as a byproduct only, which can prosper or cease to function without affecting the strength of a larger enterprise. Properly, therefore, arsenic should be produced by the smelters, with whom it is a necessary byproduct which must be wasted unless special methods are used to save and utilize it. For a mining operation to base its future, or any part of it, upon the marketing of arsenic in its ores, is ordinarily managerial folly. It has been tried many times and has been the cause of shutting down many a mining plant.

Roasting and Leaching Without Mining

ALMOST INTERESTING experiment is that which is being tried at the Copper Belle mine of the Shannon Copper Co., at Gleeson, Ariz., a mine that has been worked with skill, but varying results, for years. The copper-bearing sulphide veins have been set on fire, with the plan of attempting leaching in place after they have been roasted.

This is a logical step in the evolution of leaching processes. It has been for many years the practice in some mines to put old iron in the ditches through which flowed the water drained from copper-bearing mines, and thereby secure precipitation of native copper, the copper from the water replacing an equivalent amount of iron, which went into solution. This iron-copper material was shipped to the smelter as copper ore: and, costing nothing, helped pay general expenses. A simple and logical yet revolutionary development of this was when the management of a mine which had proved too low grade and too high cost to pay for mining transportation and treatment undertook to aid artificially the simple leaching process above described as the major feature of the mine exploitation. These artificial aids took the form of artificial supplies of water to soak down through the ore: and shattering of the ore in place by large charges of explosives, thus increasing greatly the penetration of the water. Copper, to be thus affected, must of course be highly soluble: and it is indeed almost entirely as copper sulphate that it passes into mine waters.

The success of artificially aided leaching by water in place, such as has been practiced by the Ohio Copper Co., in Utah, has depended on the fact that by oxidation the original copper sulphide has been transferred into the copper sulphate. By an old metallurgical process, broken copper ore at the surface has been artificially oxidized by roasting (heap roasting), in which the sulphur of the sulphides furnished the fuel once combustion started; and after this artificial oxidation, leaching by water has been resorted to, and proved profitable. This, for example, is done on a large scale at Rio Tinto, in Spain.

Therefore, the further experiment of roasting the ore without breaking or hoisting it—the experiment which is being tried, for the first time anywhere, at the Copper Belle mine—is a justifiable one; and the outcome will be watched with interest. This is an old mine with several thousand feet of drifts and crosscuts in a low-grade pyritic ore, some of which was caved, thus affording an excellent opportunity for roasting the exposed and shattered ore in place. The fires have now been burning a year: and the process of artificial oxidation will needs proceed much longer. In heap roasting, the complete process often takes much more than this time. Moreover, underground roasting will take longer than heap roasting, on account of the insufficient supply of air: indeed, this factor is one of those which makes the experiment uncertain.

The World's Manganese Ore Situation

THE WORLD'S CONSUMPTION of high-grade manganese ore has been, in round numbers, 1,800,000 tons per annum for many years. Prior to 1914 roughly 80 per cent of this was supplied by the three great sources, the Republic of Georgia, India, and Brazil, in about the following proportions: Georgia, 700,000 tons; India, 600,000 tons, and Brazil 250,000 tons. In 1924, the Georgian production was approximately 320,000; India produced 780,000 tons, Brazil 150,000 tons, and the Gold Coast of West Africa 250,000 tons. The average price prior to 1914, for many years, was 20c. per unit, c.i.f. port of delivery, on a 50 per cent manganese content basis.

The British control India and the Gold Coast. Of the output of Brazil, 70 per cent is shipped to the United States and the largest developed deposit is controlled by the U. S. Steel Corporation. The Tchiaturi deposit of Russia is controlled by the Union of Socialistic Soviet Republics of Russia. The size of these deposits, the high grade of the ores, and the cheapness with which the manganese can be produced, have led to keen competition. Either two of the three countries can easily supply the world's demand. Russia has had a slight advantage in costs of production over the other two great sources and has heretofore acted more or less as the price-controlling factor. The new elements which enter into the problem are the acquisition of the Tchiaturi deposits by the Georgian Manganese Co., Ltd., of which the control is in the hands of A. W. Harriman, of New York, and the development of the Dagwin concessions of the Gold Coast of West Africa. The accessibility of the deposits of the Gold Coast, the high quality, and the large quantity of the ore make this source of supply an active rival of Russia; labor costs are comparable and the quality of the ore is similar. In transportation, however, the Gold Coast has a decided advantage. The deposit is 33 miles from tidewater. Tchiaturi is 106 miles from the harbor of Poti. The steaming distance to the world's points of consumption is in favor of the Gold Coast.

Under the agreement made by the Harriman company with the Soviet Government the Harrimans are required to invest in excess of $4,000,000 and are also required to pay an annual royalty which will aggregate $62,330,000 in the period of twenty years, which is the life of the agreement. This amount is the minimum required. On Sept. 1, 1925, the Harriman company took over the accumulated stocks of manganese at Tchiaturi and Poti, amounting to upward of 450,000 tons. In addition to this it is reported an agreement has been entered into with the members of the old Tchémo Export Association, for the delivery of 600,000 tons by July 1, 1926. In the past, without materially altering the facilities for production, the Tchiaturi deposit was capable of producing with ease 1,200,000 tons per annum. Under the present concession the Harrimans are required to modernize the transportation facilities and also to improve the methods now in vogue for the beneficiation of the ores. With modern improvements, the property is

capable of producing with ease the world's consumption of manganese.

The Gold Coast deposit has been estimated to contain upward of 10,000,000 tons of easily accessible ore of commercial grade. The property is equipped and developed for an annual production of 450,000 tons. Assuming the necessity of production in order to protect capital invested as pertinent, the situation appears to be an actual capacity of production by Russia and the Gold Coast slightly in excess of the present world's demand. When India and Brazil are considered it would seem as if a production could be made with ease in 1926 about as follows:

	TONS
Russia	1,200,000
Gold Coast	450,000
India	600,000
Brazil	250,000
Total	2,500,000

This figure is approximately 700,000 tons in excess of average world consumption. Hence, the present price of manganese, of 44c. per unit on a 50 per cent manganese content basis, may be reduced materially. The present price, plus a duty of 1c. per pound, has enabled the domestic producers of manganese to obtain in the neighborhood of 63c. per unit. With the exception of the producers of manganese ore in the State of Washington, the domestic production of 50,000 tons in 1924 was largely marginal. It would therefore appear that a reduction in the world's price for manganese would tend to make production from marginal domestic mines more difficult than under present conditions.

Progress of the Metric System

THE RAPID PROGRESS which the adoption of the metric system all over the world has made is illustrated in a chart recently instituted by the All-America Standards Council, with headquarters in San Francisco. The total population of the countries which are now officially on a metric basis is over a billion, as compared with about a hundred millions in 1860, 160 millions in 1870, 280 millions in 1880, 320 millions in 1890, 370 millions in 1900, and 420 millions in 1920. The accessions since the World War are enormous, totaling 340 millions of population in the period 1920 to 1925. During this period the most populous countries which have embraced the metric system are Japan, Russia, the Netherlands Indies, and Poland. In the Western Hemisphere, the Latin American countries, being more amenable to French influence (for the metric system originated in France in 1799) adopted this system early. Yet the first South American country to take this step was Dutch Guiana, which in 1816 followed the lead of Holland. In the period 1850 to 1859, Colombia, Panama, Venezuela, Ecuador, Cuba and Porto Rico, following the example of Spain, went on a metric basis; Chile and Peru joined in the decade 1860-69; Brazil in the next decade; in the next, Costa Rica, Salvador, and Argentina; in the decade 1890-99, Bolivia, Guatemala, Uruguay, Nicaragua, and Honduras, with Paraguay and Mexico shortly after. The English-speaking part of the Western Hemisphere alone has delayed the full usage of the metric system, although it is more and more coming into common use, being the universal measure of science, experimental and applied. In Europe, the United Kingdom, among important countries, stands almost alone in not having adopted this reform, which has been accepted by France, Holland, Belgium, Spain, Italy, Portugal, Germany, Austria, Hungary, Czechoslovakia, Rumania, Sweden, Norway, Bulgaria, Finland, Denmark, Russia, Greece, Poland, and other countries.

The English-speaking world is thus the last to withstand this most logical and desirable reform. Perhaps the unwillingness to change, the clinging to tradition and to precedent, which is characteristic of these nations and is exhibited in many ways, is one of the greatest safeguards to their stability and that of the world; but having long pondered this matter and found it good, there is no question that in the course of a little while it will be adopted. It is a labor-saving device, worthy in this respect to be ranked with improved machinery. The world's trade demands common denominators; and the whole world, including the best informed opinion in the United States, has approved of the metric system. The Mining and Metallurgical Society of America, the only organization of mining engineers which has passed on the matter, has emphatically approved of the further introduction of the system.

Alcohol and Prosperity

SO SHREWD AN OBSERVER as the Hon. David Lloyd George is of the opinion that no country can hope to rival the prosperity of the United States, on account of the existence of prohibition in this country. And this checks up by inference with the opinion of Ex-Ambassador Gerard, cited recently in a *Mining Journal-Press* editorial, that England was suffering from the effects of alcohol.

All this is strangely in contrast with newspaper and magazine articles which are appearing in the United States, demonstrating that prohibition has failed; that there are more cases of alcoholism in the hospitals than ever; that crime is more rife than ever before—even, it is claimed, more strong liquors are being consumed in the United States than before prohibition.

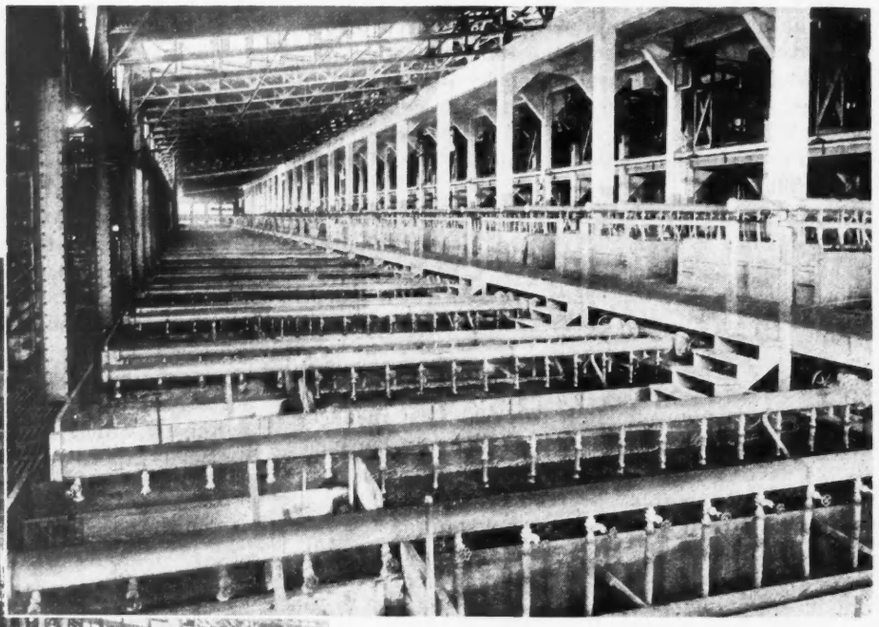
The casual observer notes that there is little drunkenness compared with former days; that the hip flask and the social bottle, though exceedingly prevalent, are seemingly largely confined to the prosperous who can afford to pay the price for the privilege of trafficking with law breakers; that there is an astonishing prevalence of comfortable living and ready money among all classes. Some time ago *Mining Journal-Press* inquired of various managers of large mines their opinion of prohibition; and the opinion was nearly unanimous that it had worked a decided change for the good; and they were for it. So far they apparently have not changed their minds.

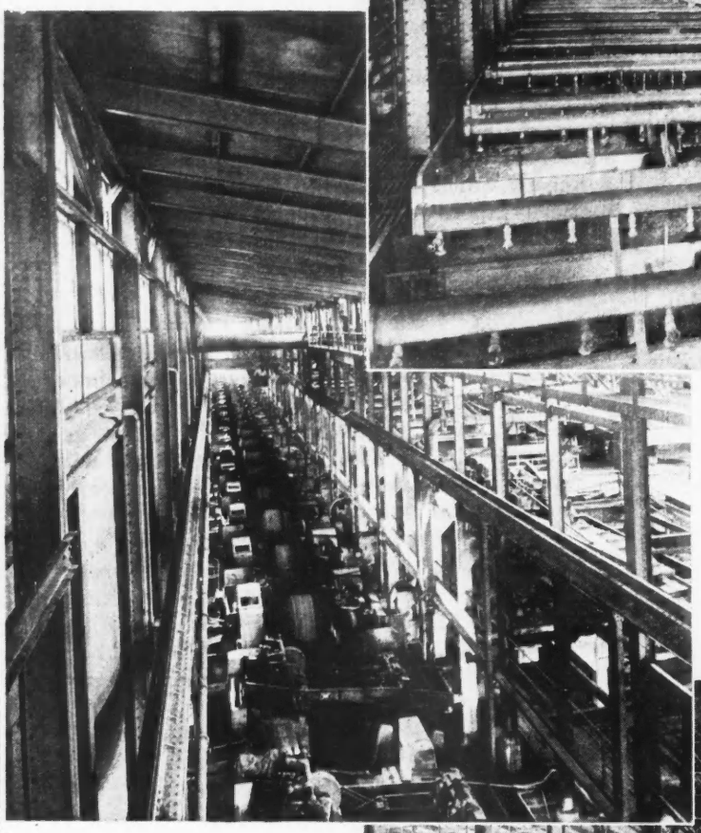
Evidently the scare articles on the failure of prohibition which are being circulated are propaganda; it may be for a better enforcement of the law; or it may be that the propaganda is directed toward a repeal of the law, in the interests of those who would profit by a repeal. The latter possibility must be considered.

It may be that the figures and charts which are being circulated do not tell the whole story. It may be that the increase in alcoholic cases in the hospitals is drawn from the very prosperous classes and the very poor and depressed classes, leaving better off than before the great mass of working and producing Americans, from whom has been removed the open menace of the corner saloon.

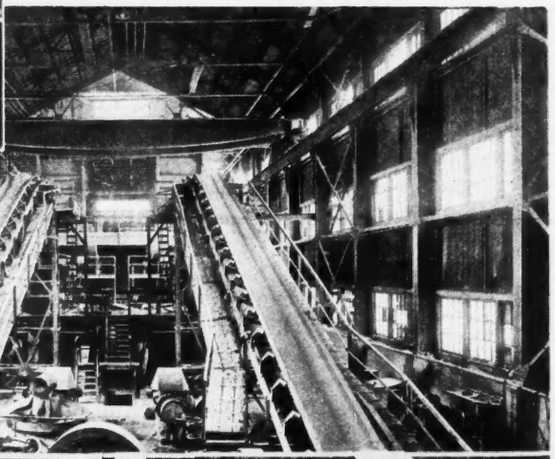
In the New Nevada Consolidated Concentrator

Right — Pneumatic flotation cells. These are mainly responsible for the excellent recovery—92.5 per cent of the copper

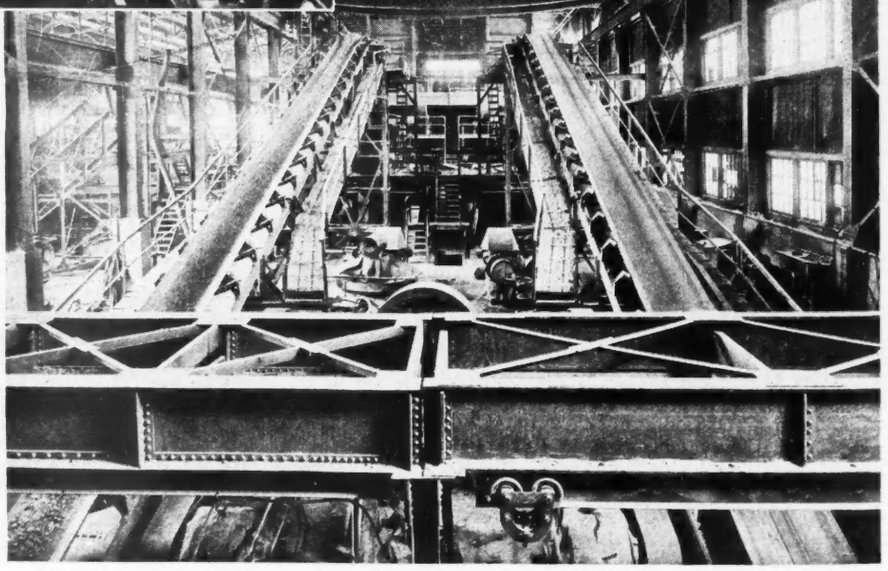




Left—Ball-mill aisle. Each of these 24 mills in closed circuit with a rake classifier has a capacity for crushing 550 tons per day ready for flotation



Right—Interior of coarse-crushing plant. New rolls have been added to permit reduction to only 10 per cent plus-¼ mesh before the ore goes to the ball-mill storage bins



The Rejuvenation of Nevada Consolidated

Since 1922 the Company Has Spent $4,000,000 for Plant Improvement—Excellent Metallurgical Recoveries—Prospective Cost of 8½c. per Pound of Copper

By Arthur Barrette Parsons
Assistant Editor

TO REJUVENATE is "to make young or *as if* young again." A mine, like a human being, cannot live indefinitely; a certain span of years and both are finished. But, also like a man, a mine can be made "as if" young again. The years of the war, though productive of big profits, imposed a severe physical strain on copper mining properties. They were overworked. The maintenance and improvement of mining, concentrating, and smelting plants were necessarily neglected to a large extent. The depression that followed was (perhaps to be accurate one should say has been) painful in the extreme; but it has, nevertheless, given the copper companies an opportunity to revamp their plants and to equip themselves for economical and efficient production that might never have been achieved if the copper market had not collapsed.

Loading ore in the steam-shovel pit

Shovels are now equipped exclusively with caterpillar tractor bases in place of those of the old railroad type

Credit Due C. B. Lakenan and His Staff

These observations apply in varying degree to most of the older American copper producers; and in particular to the Nevada Consolidated Copper Co. The fire that destroyed the old Nevada "Con." concentrator, in July, 1922, was not an unalloyed catastrophe for the reason that it gave the company an opportunity to build from the very foundation one of the most modern flotation plants in existence. Today, Nevada Consolidated is in position to rival all but five or six companies in the world for low-cost production of copper. Credit is due the consultants associated with the so-called Jackling group of properties, to the operating staff in Nevada, and particularly to C. B. Lakenan, general manager for the company, who virtually since the inception of operations in 1907 has guided affairs with outstanding success.

The Nevada Consolidated enterprise is particularly interesting because it combines in a single compact unit a steam-shovel mine; a low-grade block-caving mine; a high-grade "sedimentary" mine; a concentrator; a smelter; a railroad; and its own power plant. These all are situated in the Ely district in Nevada, the mines being at Ruth and the reduction works at McGill. Since 1922 about $4,000,000 has been spent out of earnings for equipment and in new construction, with the object of lessening the cost of production. Each of the departments enumerated shared in the appropriations and each is now in readiness to play its part effectively in producing at minimum cost.

Because of operating conditions it is advisable for the time being to mine large tonnages of lower-grade ore from the pit; moreover, the policy of the company, because of the position of the copper market, is not to strive for high production. For these reasons the new mill, with a capacity of 13,000 tons per day, is handling about 11,000 tons and the mill feed is running about 1.1 per cent copper, whereas the average assay value of the ore reserves is at least 1.6 per cent exclusive of the high-grade or sedimentary ore, in the Ruth mine. Even so, the production cost of copper, including depreciation, is now 10.95c. per pound; and if the plant were run at capacity on 1.5 per cent ore, with the present recoveries and the same per-ton operating costs, the per-pound cost of copper would be just over 8½c. This is, of course, a hypothetical calculation; smelting costs based on the ton or ore would increase, as might

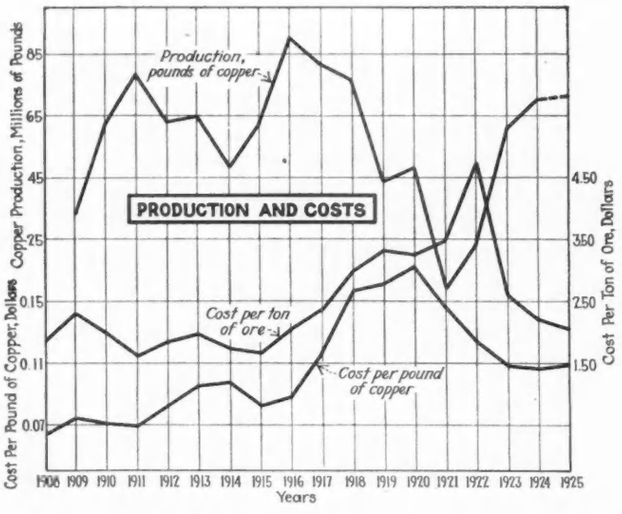

Production, pounds of copper
PRODUCTION AND COSTS
Cost per ton of ore
Cost per pound of copper
Copper Production, Millions of Pounds
Cost Per Pound of Copper, Dollars
Cost Per Ton of Ore, Dollars
Years
1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925

Fig. 1—Nevada Consolidated production and costs

Copper probably never again will be made as cheaply as in 1908-11, but the reduction in cost since the war is remarkable.

other factors; but the figure is significant. Surely, Nevada Consolidated has been rejuvenated!

It is not intended in this article to describe operations in detail, but some notes on the new equipment installed and the results obtained help explain the reasons for the remarkable reduction in costs as indicated in Fig. 1. This has been effected in the face of the prevailing high wage scales and comparatively high prices for machinery and materials used in operation.

Open-cut mines—The steam-shovel equipment now consists of nine Bucyrus 95-C shovels, 3½ cu.yd. dippers, all provided with caterpillar tractors, in place of shovels of the old railroad type. This feature has eliminated the laying of "shovel" track and made operations more mobile and economical. Two new 85-ton American locomotives and two Peterson track shifters, made by the Nordberg Manufacturing Co., have also been added to the equipment. There now are twenty-one locomotives in use at the property.

Drilling and blasting is one item in which the cost has been materially reduced. The accompanying photograph shows a blast on a 60-ft. bank approximately 1,200 ft. long. Black powder, with about 2 per cent dynamite, was fired with Cordeau-Bickford detonating fuse. Following are details:

Number of holes	26
Distance from toe of bank to center of holes, ft	70
Distance center to center of holes along bank, ft	45
Estimate of material broken, tons	430,000
Cost per ton broken	$0.0255

During the present year preparations are being made for the mining by underground methods of orebodies that adjoin or nearly adjoin the open pits, both laterally and at greater depth. Many of these can be mined more economically by underground operations because of the prohibitive cost of stripping the ore at deeper levels.

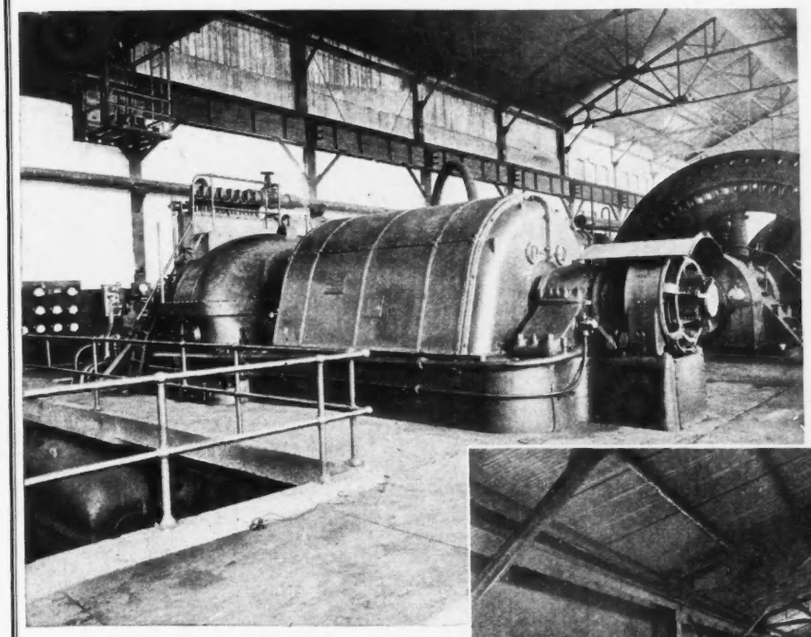
Although steam-shovel operations will continue for five to seven years to be the major means of mining in the pit area, it is proposed during the transition to conduct operations of both types concurrently as affording the most advantageous procedure.

Verification of Churn-Drill Sample Results

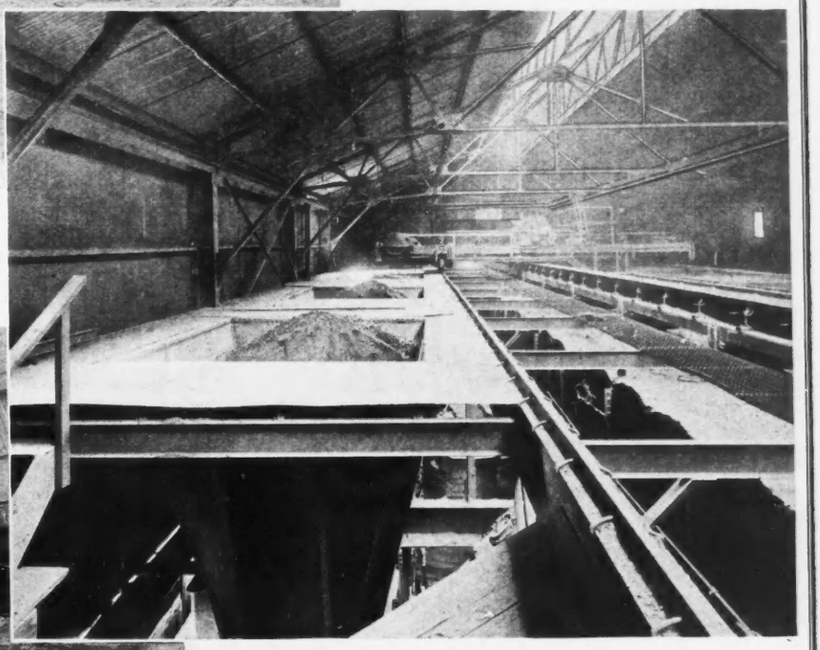
An interesting check as to the reliability of churn-drill sampling for determining the extent and grade of deposits of disseminated copper ore was made at the end of 1923. Certain sections yielded 30,701,000 tons of ore averaging 1.55 per cent copper. These realizations were 114.04 per cent of the expected grade. Many of the holes upon which this "expectancy" was based were as much as 200 ft. apart. A significant point is that at greater depth the pit ores contain a materially increased proportion of primary chalcopyrite and re-

Breaking 430,000 tons of ore with a single blast

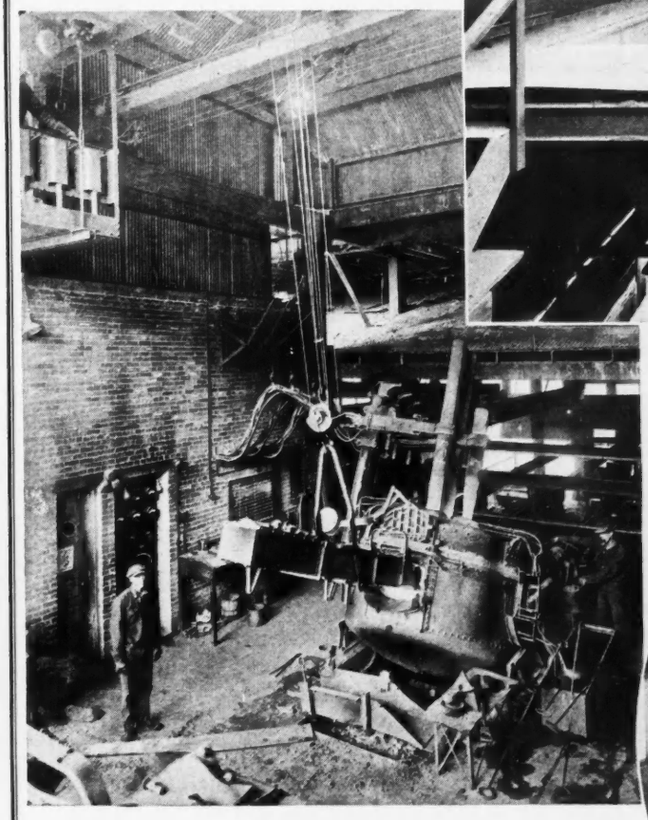
The bank is 1,200 ft. long; twenty-six holes charged with black powder and a little dynamite are fired simultaneously with Cordeau-Bickford detonating fuse



Left—New 12,500-kw. steam turbo-generator recently installed in the power plant to displace old reciprocating equipment, which now is held in reserve

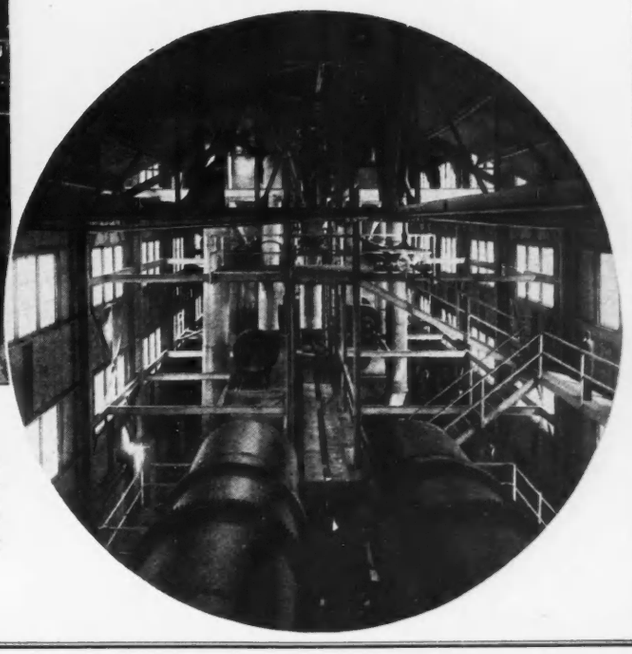


Right—New feed hoppers and distributing conveyor system over the roasters



Above—Electric foundry furnace, recently installed. Semi-steel balls for use as grinding media in the concentrator, as well as small steel and gray iron castings of many kinds, are made by means of this furnace

Below—Interior of the coal-pulverizing plant. Note the complete absence of dust



Crane and "stripping" shovel under repairs

Like other machinery, steam shovels occasionally get out of order. This mounted crane is invaluable in first aid and likewise serves many other useful purposes

duced proportion of chalcocite, a favorable indication for future ore development. Table I shows the cost of steam-shovel operations in recent years, exclusive of depreciation and taxes but including all other overhead expense. The figures do not include 40c. per ton of ore mined which is charged regularly to cover prepaid stripping expense.

Table I—Cost of Steam-Shovel Mining

	Per Ton Ore, Cents				Per Cu. Yd. Stripping, Cents			
	1924	1923	1922	1921	1924	1923	1922	1921
Drilling and blasting	3.85	4.22	3.78	6.45	7.71	9.36	9.50	11.26
Steam-shovel operations	4.41	4.65	2.73	2.77	9.16	11.90	6.24	5.78
Locomotive tramming	8.35	6.80	4.44	7.69	23.16	20.62	16.23	18.23
General pit expense	1.39	1.74	3.71	1.78	1.98	2.64	2.64	1.25
Administration and general	3.42	2.75	7.54	9.42	5.66	5.26	8.79	4.71
Totals	21.42	20.16	22.20	28.11	47.67	49.78	43.40	41.23

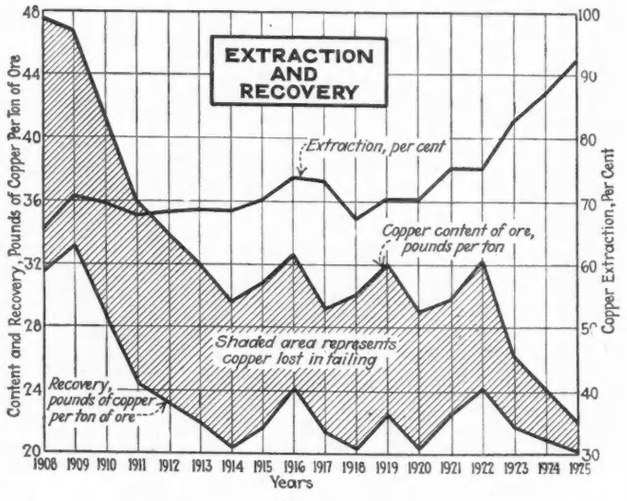


Fig. 2—Nevada Consolidated concentrating results

In 1925 almost as much copper was recovered from a ton of 1.1 per cent ore as from a ton of 1.48 per cent ore in 1914

Underground mine—The Ruth underground mine is producing 2,700 tons of ore daily. The branch-raise caving system as developed at this property is working satisfactorily. An important factor is the relative softness of the ore, which aids in the close control of drawing, with the consequent avoidance of serious dilution. During the last two years the main loading station and the approaches have been "gunited" as a measure for fire protection; the wood frame housing over the Star Pointer (main hoisting) shaft has been replaced with a steel structure; and six stope scrapers actuated by Sullivan double-drum hoists have been installed in the high-grade stopes. Other improvements consist of a commodious reinforced-concrete change house for miners and a fireproof sawmill for framing timbers. A new brick school building and additional living quarters have also been constructed at Ruth.

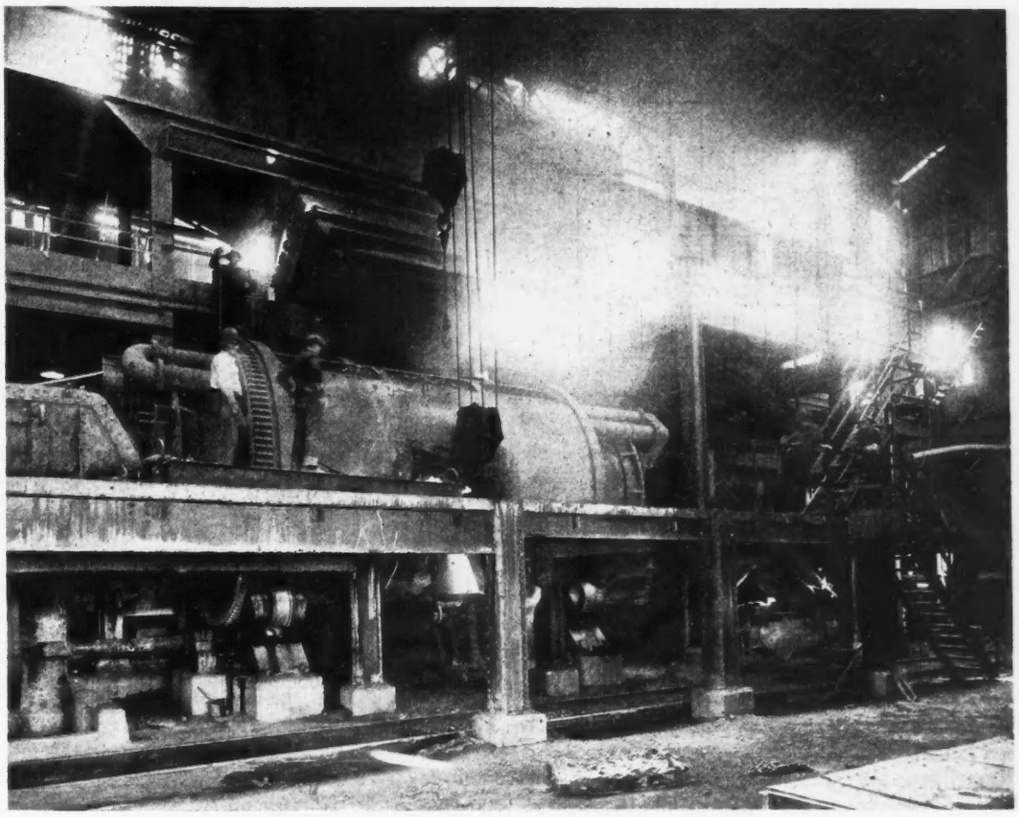
The dependability of churn-drill results, as well as the effective manner in which the mining is being done at Ruth, are indicated by the record made. For those portions of the Ruth mine that are considered finished, and for the first 50 per cent of ore drawn from the branch raises, the results of the underground operations up to Dec. 31, 1924, compared to "expectency" grade and tonnage as figured from drill holes, are shown in Table II.

Table II—Recovery by Branch-Raise Caving

	Expectancy		Extraction		Extraction, Per Cent	
	Tons	Grade	Tons	Grade	Tons	Grade
3 Level	354,255	2.20	352,750	2.22	99.575	100.5
4 Level	121,000	2.21	121,559	2.26	100.2	102.6
5 Level Block I	839,120	2.27	874,768	2.03	104.2	93.2
5 Level Block II	201,132	1.94	192,181	1.79	95.5	88.2
5 Level Block III	206,875	1.77	212,047	1.65	102.5	95.5
6 Level Block I	236,280	1.73	234,862	1.60	99.4	91.9
6 Level Block II	1,320,859	2.01	1,429,170	1.87	108.2	100.7
6 Level Block III	1,713,420	2.09	1,754,542	1.85	102.4	90.5
6 Level Block V	164,218	1.79	171,115	1.62	104.2	94.1
7 Level Block I	68,610	1.66	71,080	1.52	103.6	95.1
6 Level Sub-Scram	1,278	1.06	1,309	0.97	102.4	93.7
	5,227,247	2.06	5,415,383	1.88	103.6	94.8

Underground mining costs for "porphyry" ores, exclusive of charges for prepaid development, depreciation, and all taxes, but including all other overhead expense, are shown in Table III.

Crushing and Concentrating—The outstanding improvement, however, is in the ore-dressing operations. Not only has the cost of milling and concentrating been reduced from $1.075 to $0.597 per ton since 1919, as indicated in the accompanying table, but the recovery during the same period has been increased from 70.49 per cent to 92.45 per cent, the last-named figure being the record for the first half of 1925. Incidentally, in 1918 the recovery was only 67.28 per cent.



New Peirce-Smith converter at the smelter

Converting equipment is now more than adequate to produce 10,000,000 lb. of copper per month

Table III—Cost of Mining by Branch-Raise Caving

	1924	1923	1922	1921
Branch raises and sublevels	$0.134	$0.1921	$0.2434	$0.2235
Undercutting and caving	.206	.2231	.1214	.1805
Tramming expense	.086	.1059	.0670	.0623
Hoisting expense	.052	.0600	.0482	.0460
General underground upkeep	.302	.3092	.2634	.1881
General mine expense	.091	.0974	.0560	.0702
Administration and general	.098	.1100	.0880	.0863
Totals	$0.969	$1.0977	$0.8874	$0.8569

Comparative costs for milling and concentrating, excluding depreciation and taxes but including all other overhead expense—together with the tonnage milled per man—including all operating and repair labor—are given in Table IV.

This table taken in conjunction with the performance recorded in the graphs in Fig. 2 may well be termed sensational. The lower curve shows the number of pounds of copper recovered from each ton of ore and the shaded area represents the copper lost in tailing. In 1925, it will be noted, approximately the same amount of metal is being saved from each ton of ore as in 1914, 1918, and 1920; but in 1925 the heads contain only 22 lb. of copper, as against 29.66 lb. in 1914 and nearly as much in the other two years mentioned.

Sodium Zanthate Improves Economy

The big factor in the increased recovery is, of course, the improved technique of froth flotation, particularly the introduction of sodium zanthate in an alkali circuit as the flotation reagent. Contributing to the result is finer grinding of the flotation feed in ball mills.

Reduction in operating cost is the result in part of the simplification of the flow sheet; but the principal reason is the careful designing of the new plant with the object of reducing the labor required for both operation and repair of equipment. Machinery is made to do the work with a minimum of attendance. Efficient and reliable equipment for feeding, conveying, elevating, pumping, and dewatering is a feature. Pulps for the most part are elevated by means of air lifts; and dry ore is raised by means of inclined con-

Table IV—Cost and Labor Efficiency of Milling

	Cost of Milling and Concentrating, Cents per Ton	Tons Milled and Concentrated per Man-Shift
1919	107.5	15.3
1920	96.9	17.5
1921	88.1	24.9
1922	85.0	24.7
1923	61.7	30.7
1924	59.7	28.3

veyors. An interesting point in the design is that the ground area is only 198,000 sq.ft., or only 63 per cent of that of the plant that was destroyed by fire, whereas the capacity is the same. Steel and concrete are used in the construction to the almost complete exclusion

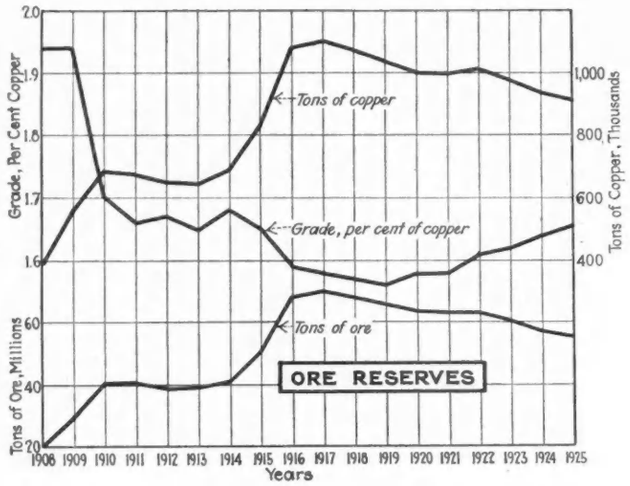


Fig. 3—Nevada Consolidated ore reserves

Low-grade ore "partly" developed since 1918 has not yet been calculated in the reserves. The policy of mining ore below average grade has caused the curve of copper content to ascend.

of wood. There are in the new plant twenty Hardinge ball mills and four P. and M. cylindrical mills, each operating in closed circuit with Dorr rake classifiers; 370 Wifley tables; and 132 primary pneumatic flotation units each of seventeen cells, followed by thirty-three twelve-cell cleaning units. Four Wifley sand pumps and four Oliver filters for drying the flotation concentrate are other items of equipment. Table and flotation concentrates are mixed for haulage to the smelter.

The coarse-crushing plant, a separate unit built in 1918, was not destroyed by the fire. Additional equipment has been installed, including two sets of 20 by 72-in. rolls. The last two sets of rolls in the flow sheet are run in closed circuit with vibrating screens so as to deliver to the fine-ore bins a product of which only 10 per cent is coarser than ¼ mesh, considerably less than formerly. This finer preliminary crushing or grinding has made it possible for the ball mills to handle effectively 550 tons each per day.

Inclined Conveyors Displace Elevators

The principal items of equipment in the coarse-crushing plant are traveling grizzlies, McCulley gyratory crushers, Garfield rolls of the heavy type, Hum-mer screens, and a rather elaborate system of conveyors made by the Stephens-Adamson Co. Inclined conveyors serve to elevate the ore wherever necessary. As will be noticed in the accompanying illustrations overhead cranes serve all of the heavy machinery. Also individual electric motors operate the various pieces of equipment.

Smelter—Much has been done toward remodeling the smelter. The roasting plant consists of twenty-eight McDougal furnaces with a normal daily capacity of 1,680 tons of feed, about 3 per cent of lime rock being mixed with the concentrate. Four of these furnaces are new, as is also an excellent belt-conveyor feeding system for the whole department. Instead of the old 10-ton cars, 70-ton cars are now used to bring the concentrate from the mill to the smelter. In one of the accompanying photographs are shown the new steel feed hoppers and the conveyor and tripper above the roasters.

Originally five reverberatories were in service. These have been replaced with three units of larger capacity, the largest of which is 30 by 134 ft., inside measurement. A new structural steel charge track has been installed to facilitate and expedite feeding. The largest furnace is served by three 800-hp. waste-heat boilers arranged in multiple behind it; and each of the others are served by three 400-hp. boilers. The economies effected by the use of these boilers is reflected in the performance data shown in Table V.

Table V—Data on Reverberatory Smelting Results

	Coal as per Cent of Charge		
	Gross Ratio	Net Ratio After Waste Steam Credit	Tons Smelted per 100 Sq.Ft. Hearth Area
1919	20.5	14.9	18.21
1920	17.9	14.6	21.60
1921	19.7	12.4	21.20
1922	23.8	14.1	15.80
1923	17.8	9.0	20.33
1924	15.3	8.5	22.41

The figures in the last column, which do not include hot slag from the converters, show progressive improvement.

For many years the converting department has consisted of two 10 by 26 ft. Peirce-Smith converters. During the present year a new 12 by 30-ft. Peirce-Smith of the Tacoma type, the latest design, has been installed and blown in.

New Equipment in Power Plant

Power Plant—As the power plant at McGill generates electric energy for mine, mill, and smelter, this is an important phase of operations. During 1924 three important additions were made to the equipment: (a) A 12,500-kw. General Electric steam turbo-generator, (b) an Ingersoll-Rand steam turbo-blower with a capacity of 80,000 cu.ft. of air per minute at 6-lb. pressure for use in the flotation cells in the concentrator, in connection with which is a long 63-in. air line from the power plant to the concentrator, and (c) a 5,000-cu.ft. uni-flow steam-driven compressor, manufactured by the Worthington company to supply air at 80 lb. to operate air lifts in the concentrator. The plant now has sufficient steam equipment of the turbo type to supply all needs of the entire property when operated at full copper-producing capacity; the old and less efficient reciprocating engines are held in reserve. The current coal consumption per kilowatt-hour averages only 1.95 lb.

All of the smelting departments, including the roasters, reverberatories, and converters, and a large portion of the power-house boilers, are operated with powdered coal, pulverized in a plant of 600-ton daily capacity. Minor improvements have been made, principally in the distributing system.

Foundry—Indicative of the size of the Nevada Consolidated enterprise is the fact that the company has its own foundry; and indicative of the progressive character of the management is the fact that an electric foundry furnace with a capacity of 1½ tons per hour has been installed. This furnace, made by the Pittsburgh Electric Furnace Corporation, is used not only for ordinary grey iron castings to be machined in the company shops, but for small steel castings and for semi-steel balls to be used as grinding media in the concentrator. About 30,000 tons of accumulated

steel and iron scrap is being worked up at a lower cost than was obtained in the old foundry practice with cupola furnaces.

Ore Reserves—Some explanation of the graphs of ore reserves shown in Fig. 3 should be made. The only increase in the reported tonnage of reserves since 1918 is 489,718 tons of 7 per cent ore developed in the Ruth sedimentary deposits in 1922. This fact, together with the policy of mining and milling ore much below the average grade of the reserves, has been responsible for the progressive increase in the copper content as shown in the graph. At the same time, development has not been neglected entirely, and churn drilling has indicated so-called "partially" developed ore approximately equivalent to the amount mined each year. This has not been calculated into the reserve tonnage as yet.

Excellent Outlook for Future

It is true that shareholders have not had a dividend since 1920. However, they are immensely better off today than they were at the end of that year. On Jan. 1, 1921, the excess of quick assets over liabilities was $8,703,049. On Jan. 1, 1925, the corresponding figure was $7,781,614. If to this be added the increase in earned surplus resulting from operations during the first half of this year the total is $9,000,619. In the meantime, the company has not only weathered the most disappointing period in the history of the copper-mining industry, but it has spent out of earnings $4,000,000 cash on betterment of its plant. In this article has been sketched the way this money has been applied under the most competent technical guidance to put the property in the best possible physical condition to produce copper cheaply. Given a strong market and a reasonably good price for the metal, so that the company will be warranted in producing at the maximum capacity of its plant, and Nevada Consolidated ought to give an excellent account of itself.

Claims New Shaft-Sinking Record

A new world's record for shaft sinking is claimed for South Africa by the *Mining and Industrial Magazine*, which says: "In this instance the young jackhammer has beaten the old 'three and a quarter,' so to speak —for it has remained for Arthur Rees, son of Ivor Rees, to break his father's best sinking performance. The new record has been put up at No. 16 shaft of the Crown Mines, where during the month of August 318 ft. were sunk.

"Sinking 318 ft. in 31 days is a world's record, and in doing it Arthur Rees beats the record held by his father of 310 feet at No. 15 shaft, Crown Mines, in July, 1919. Arthur Rees was one of the men who helped to establish that record in 1919, and now he has got 'one up' on dad.

"The No. 16 shaft, Crown Mines, is now down 1,113 ft. Actual sinking operations were commenced at the beginning of the year. Arthur Rees broke the record with four W.L.B. jackhammers and four C.H.2 sinkers, manufactured by Messrs. Holman Bros., of England. Perhaps Ivor Rees, who is now in Cardiff, and who only left South Africa a few weeks ago, when he hears of this filial challenge, will return in order to take the wind out of his son's sails."

Divine Gumption

By Fred C. Bond

We all want to write. Articles appear which we wish to match or supplement; and yet what an effort is the actual setting of a pencil to paper, what a struggle to co-ordinate and concentrate, and how the selective faculty functions overtime while the constructive one lags, so that after an hour all we have to show for our efforts are a few disconnected ideas and a jumble of scratched-out lines. Indeed, writing is in too many instances a mere case of pen chewing and a relapse into rumination. But the rewards are well worth looking into. An accepted article means a most favorable appearance before a large audience, and in the most propitious of circumstances; that is, our thoughts absolutely naked and alone, unattended by the personal eccentricities of face and form that hamper so many and bolster only a few. Thus, for a brief space we may pose as authorities, a thing which leaves an abiding sweet taste in the mouth.

And taking up this matter of rejection slips. How nicely they are worded to avoid any sting, and yet how undeniably conclusive they are. "This does not imply any lack of merit—it frequently happens that material rejected by one periodical will be accepted by another"—etc. All delicate irony—and often with just a touch of pathos. The accumulation of these brief bits of literature is entered into with such zeal by professional collectors as to shame the rest of us. And certainly their possession should be no direct cause of shame. "'Tis better to have tried and failed than never to have tried at all." Perhaps, after all, the main benefits derived from technical writing accrue to the writer himself. Certainly the training in organizing a thought is of great value.

But the outstanding fault in the technical field appears to be not too much writing, but too little. Experiments of value often fail to get themselves described, and new processes, as well as unique applications of old processes, do not find their way into print in anything approaching the manner that "murder will out" nowadays in the daily papers. The application of direct cyanidation to flotation concentrates is in a poor plight when compared for publicity with the application of a hammer murderess for a new trial. But that is the difference between news and progress, and probably will be as long as this merry old world bumps on its way. But why should progress be disheartened—

"A youth who bore 'mid snow and ice,
A banner with the strange device——,"

There is cake enough for all, and every one who does his stint should demand his slice.

Mining Taxes in the Netherlands

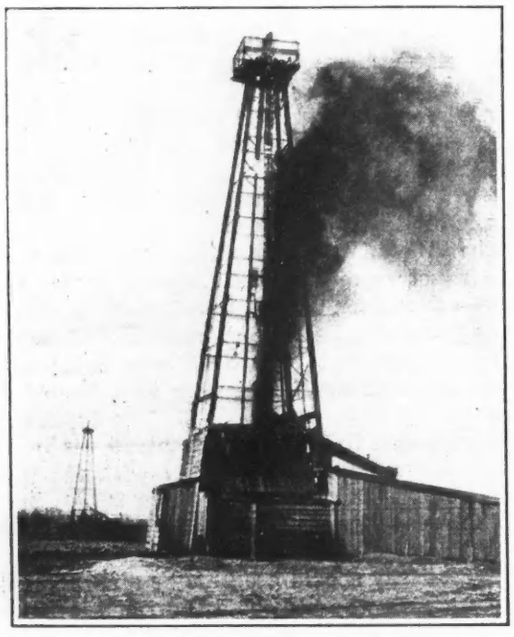
Mining taxes are levied in the Netherlands on all minerals, whether from private or government property, says Consul Edward A. Dow, in *Commerce Reports*. Twenty per cent of this tax is paid to municipalities in whose districts at least fifty miners were living at the end of the year. Another 20 per cent is paid to those municipalities whose regular expenditures have increased owing to the construction or operation of a mine, and 10 per cent of the yearly proceeds of this tax is paid to the provinces within which mines are being operated.

Detonators for Shooting Oil Wells
Past and Present

By James Calhoun
226 U. S. National Bank Bldg., Denver, Colo.

GENERALLY SPEAKING, oil wells are shot to facilitate the flow of oil by breaking up the sands. This increases the area of supply by enlarging the bore and by creating fissures and channels extending from the hole into the surrounding strata. The practice is not general in the oil fields of the United States, but is confined largely to wells drilled in the hard formations of Wyoming, Kansas, Oklahoma, Illinois, Pennsylvania, West Virginia, and certain other fields. In these areas wells are shot often —upon completion and whenever production shows a tendency to decline.

Shooting is also resorted to with advantage in many instances not directly related to the production of oil. For instance, wells are shot to straighten a crooked hole; to shatter boulders or artificial obstacles lodged in the hole; to dislodge and recover casing in an abandoned hole.



A Wyoming well after being shot with 60 qt. of nitroglycerine and an electric time bomb

In each instance a charge of nitroglycerine is lowered to the desired point and detonated by one of many devices in use. The size of the shot conforms to the result desired and varies from 5 to 200 qt. or more.

History of Oil-Well Shooting

Oil-well shooting dates back to the '60s, when Colonel E. A. L. Roberts theorized upon the possibility of adding to the production of a well by opening, by artificial means, the fissures and crevices extending outward from the hole into the body of the sand. As frequently happens when a man develops an entirely new idea, Colonel Roberts experienced great difficulty in convincing the producers of his time of the feasibility of his plan. Several years passed before he succeeded in obtaining permission to shoot a well, one that had been drilled in as a producer but had ceased to yield. This well was located on Watson Flats, below Titusville, Pa. On Jan. 21, 1865, Colonel Roberts lowered a torpedo containing 8 lb. of powder into this well and detonated the charge at a depth of 453 ft. "The explosion caused the oil and water to shoot out of the well about 30 ft. into the air and made the earth groan like some great monster in the agonies of death." The records show that Roberts continued to explode his torpedoes with excellent results in various dry holes and in wells of small production.

There soon appeared a number of imitators, certain unauthorized persons known in the varnacular of the day as "moonlighters," who went about the fields exploding torpedoes of their own manufacture in wells as occasions arose. Roberts, having applied for a patent, was subsequently successful in his efforts to eliminate unauthorized use of his idea. In 1866 the board of examiners in chief of the Patent Office united in a decision that, "although all parties to the case conceived practically the same idea of augmenting the flow of oil by the method in dispute, Roberts was the only one who could show that he had commercially developed the idea and obtained therefrom practical results." The patent was accordingly granted.

From this modest beginning oil-well shooting has come down to us today as an accepted practice little changed in its basic idea from the method adopted and perfected by Roberts. So widespread and general has its use become in most of the primary producing fields of the United States that no one can even approximate the influence it has had on domestic production. It is reasonable to assume that the practice of shooting wells stands forth as one of the significant developments in the production of petroleum.

The Risk in Shooting—Types of Detonators

Placing the nitroglycerine charge in a well is a comparatively simple operation and, in the hands of experienced men, is accompanied with a minimum risk of damage to the well. The great danger in oil-well shooting accompanies the effort to detonate the charge, which must be accomplished by an independent force applied from the top of the well. As few new wells are now less than 1,800 ft. in depth, and up to 4,500, and as conditions of fluid, magnetism, friction, gas pressure, cavings, and other natural phenomena vary with each well, it can readily be understood that the problem of detonating the main nitroglycerine charge is a perplexing as well as a risky one.

The method used by Roberts when he shot the first oil well in the '60s is still in use today in the Ohio and Pennsylvania fields. It is known as the "go devil" and consists of fitting the upper end of the top canister containing the nitroglycerine with a firing head or disk, fitted in turn with a percussion cap. To explode the charge a cone-shaped piece of cast iron, known as the

"go devil," is dropped from the top of the hole into the well; this, upon striking the disk, explodes the cap by concussion and this explosion, in turn, detonates the nitroglycerine.

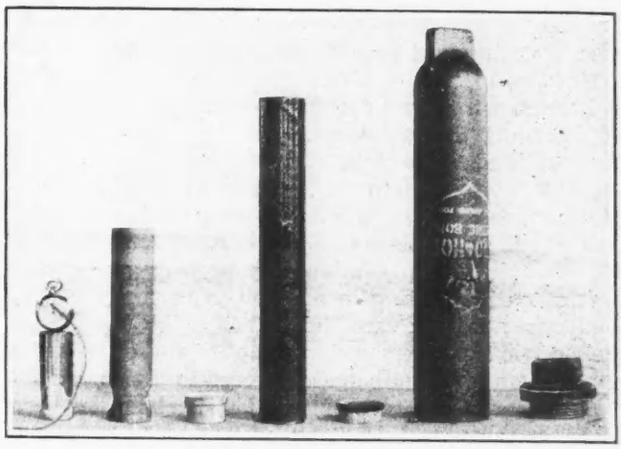
Historically, as revealed by records in the Patent Office and elsewhere, we find record of the invention of improved types of detonators—the line squib, bumper squib, jack squib, and electric wire shot.

Line and bumper squibs are closely related to the "go devil" and follow it in history of development. The former consists of a 15-in. tin shell equipped with a firing head and three-piece pin; three percussion caps are fitted to the pin; a sash weight is attached to the lower end for weight and the squib is lowered on a squib wire into the well until it rests upon the top of the nitroglycerine shell. Slack is then taken out of the wire and a nipple or short piece of pipe dropped over the wire strikes the firing head, exploding the cap by concussion. The bumper squib consists of two tin tubes soldered together, the lower being fitted with firing head, pins, and percussion caps. Sufficient nitroglycerine is poured into the lower tube to fill it up over the caps attached to the firing pin. Two sash weights are attached, one on the lower end to carry down and one above for concussion purposes. When the squib has been lowered onto the main charge, a sudden slacking away on the squib wire causes the upper weight to drop and strike the firing head, exploding the squib and shot.

Next in development is the jack squib, which has perhaps attained wider use than any other method of detonation. It dates back about forty years, and its widespread use is probably due to the fact that it is furnished, without additional cost, by the torpedo or shooting company which manufactures and places the nitroglycerine. The jack consists of a small tube containing dynamite or nitroglycerine. Several feet of waterproof fuse are spiraled around this tube and connected near the bottom with a mercury cap. Tube, fuse, and cap are then inclosed in a reinforced tin shell, the space between being packed with sand, which gives weight and absorbs any nitroglycerine that might leak out of the tube. The end of the fuse protruding from the upper end of the shell is lighted and the jack is dropped into the hole, the theory being that the shooter has chosen a fuse of just the proper length that will cause the jack to explode when it has reached a point sufficiently near the main nitroglycerine charge to detonate it. The length of fuse not only varies with the depth of the well but with other conditions, principal of which is the amount of fluid standing in the hole. Ordinarily, the jack will not function where the fluid exceeds 1,000 ft.

The disadvantages of the methods of detonation described above are many and well recognized in the oil industry. All of the so-called "squib shots" are open to one or more of the objections mentioned below, and their usefulness accordingly is greatly limited.

None of the above-described detonators can be successfully used in caving formations, and where, on account of the size of the shot, it is necessary to raise the casing. The shot, of necessity, must be placed in relation to the pay sand; therefore, when the casing is raised, caving ground falling in on top of the shot will prevent placing the squib close enough to the shot to detonate it. Where caving is not bad, it would in some cases be possible to clean the hole out with the proper tools, but this is hazardous, as often the concussion of the tools will explode the shot, wedging the tools in the hole in such a way as to plug the well, possibly permanently.



Parts of the electric time bomb before assembling

The use of a bumper squib or jack squib is always accompanied with great risk of damaging the casing or the well. It often happens that the bumper squib becomes lodged in the casing, and while attempting to loosen it, the weight strikes the firing pin, causing a premature explosion, resulting in a collapsed or bursted casing, delay, and added cost of replacement. The jack squib is also quite likely to explode prematurely due to using a fuse of too short length, too rapid bursting of the fuse, or the jack itself may be retarded by fluid or other circumstances.

None of the squib detonators can be depended upon to detonate the charge where and when wanted; this is especially true of the jack. With the "go devil" and the line squib, the least tendency to caving may prevent discharge, or the weight may pierce the nitro shell without exploding it, permitting the liquid to escape. It is a common occurrence to use several jacks before one succeeds in detonating the shot, and it frequently happens that it is altogether impossible to place a jack in the proper position to detonate the charge.

The Electric Shot—Its Disadvantages

The electric wire shot consists of a tube containing 2 to 3 qt. of nitroglycerine and a fulminating cap. Electric wires are connected with the cap and the shell is lowered, from a reel, to the proper position on top of the main charge. The upper ends of the electric wires are then connected with an electric battery at the top of the well; closing of the electric circuit explodes the squib at the bottom of the well, which in turn detonates the main charge.

This method of detonation is comparatively of recent origin, having first been used twenty-three years ago by one Mendenhall, a shooter operating in the Illinois fields. Its use is generally restricted to wells drilled in formations susceptible to caving, which necessitates casing a well too near the pay sand. To explode a charge of nitroglycerine larger than 20 qt. in such a well, without first raising the casing 100 ft. or more, would result in great damage to the casing, perhaps to the well itself.

By using squibs it would be impossible to detonate charges under such conditions, due to the reasons stated

heretofore, but with the electric shot the main charge and the detonating charge are placed together before raising the casing. No amount of caving can prevent the detonation, provided, of course, the wires remain intact. From the standpoint of safety and dependability, the electric shot represents a great improvement over the squib, but even it has disadvantages of a most decided nature.

Electric wire shots are quite expensive. To the cost of threading the casing over the wires must be added the cost of the wire itself at 4c. per running foot, making the total expenditure in wells of usual depth of considerable concern. Moreover, the producer is always confronted with the possibility that at some stage of the operation the insulation may be damaged by accident or from buffeting in the well, rendering the wires ineffective; in that case the well must be cleaned out, the electric squib removed, a complete run of new wire attached, and the squib again lowered to placement.

Another disadvantage of the electric shot is the tendency of the wire to ball up or bridge in the casing from force of the explosion. Generally the wire is so tightly wedged in the casing that several days are necessary to fish it out or drill through it. This is not only a source of additional expense but, in part at least, defeats the very purpose of shooting, which is, first, to break up the sands, and second, to permit the well to clean itself by ejecting the accumulation of mud, paraffine and debris that has retarded the flow of oil.

Though the electric shot represents a most important advance in methods of detonation, its disadvantages are of such pronounced nature that it has never developed very wide use. Yet the industry owes a debt to the originator far greater than any reward he has reaped, for the electric shot has functioned with great reliability in many instances where it would have been impossible to use any of the older types of detonators.

The Electric Time Bomb

This was the state of the art at close of the World War. At that time E. T. Williams, a producer, and J. A. Morrison, a driller, both of Casper, Wyo., conceived the idea of detonating shots in oil wells by means of a bomb which should be time controlled and either electrically or mechanically operated; the bomb was to be entirely self-contained and dependent upon no exterior force for detonation. The records show that Morrison, with the advice and assistance of Williams, did actually construct and place a number of bombs of different types in various wells in Wyoming, but with a somewhat checkered success. Upon the retirement of Williams and the death of Morrison, about 1923, the patent rights and models of Morrison and Williams were turned over to W. J. Cheley, for many years a prominent producer in Wyoming, and W. F. Bleecker, a scientist at one time connected with the University of Colorado and later with the Westinghouse Electric & Manufacturing Co.

The new company opened a laboratory at Boulder, Colo., to conduct research work regarding the use of explosives at great depths, the conditions to be encountered in the depths of the earth, and other phenomena and conditions to be overcome in shooting oil wells.

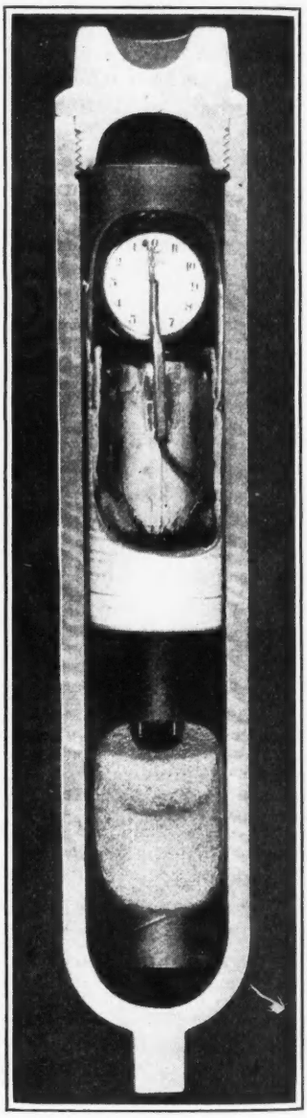
The idea of a mechanically operated bomb was discarded because of its lack of dependability, and attention was centered upon developing an electrically operated device. In August, 1924, the first bomb was turned out and successfully detonated a charge of nitroglycerine in a well of the Midwest Refining Co. in the Salt Creek, Wyo., field. Six additional bombs were manufactured in August and successfully used in Midwest wells. So uniform and dependable was the action of these bombs that the company began quantity production and introduction to the oil industry in general. This electric time bomb of Williams and Morrison, therefore, antedates in conception, though perhaps not in actual time of the first placing, any of the mechanical bombs now being exploited. Several changes, additions, and modifications have been made the past year, though the basic idea remains unchanged.

Has Four Parts

The electric time bomb consists of four essential parts, a cast-iron shell in which the mechanism is inclosed, a timing mechanism, an electric dry battery, and the explosive. The cast-iron shell is not only waterproof but has been developed to assure protection against the magnetic forces encountered in all oil wells, and to eliminate the danger that arises from friction. In addition, upon explosion the cast-iron shell is shattered into small bits, eliminating any possibility of forming a bridge, such as results from the electric wire shot.

The timing mechanism is a clock watch, selected for its ruggedness and dependability. The watch is fitted with a special reversed dial to aid the shooter in figuring the time of explosion. Through the dial of the watch and immediately below the zero hour (12 o'clock) a small hole is drilled; through this a platinum firing pin, soldered to the end of the wire leading from the battery, is passed and anchored in the dial of the watch. The minute hand is cut short, and the hour hand tipped with platinum. The contact of the hour hand of the watch with the firing pin closes the electric circuit. The watch forms an integral part of the positive pole of the battery.

The battery is made especially for the bomb and is sufficiently powerful to set off ten No. 8 electric blasting caps; two caps, connected in parallel, are furnished, though one cap will explode the charge. The electric wires pass down between the sides of the battery and the container, terminating in cir-



Cross-sectional view of an electric time bomb

cular recesses in the opposite sides of a wooden plug about midway of the bomb. To the ends of these wires the shooter attaches the wires of the caps.

The blasting caps extend downward from the plug and are imbedded in 1¼ lb. of 60 per cent nitroglycerine dynamite, which fills the lower portion of the container. The size of the bomb is 3¼x19 in., and its weight 24 lb. when loaded.

The reversed dial tells the shooter at a glance the proper position to set the watch to allow for the elapse of the desired time before discharge. For instance, if the producer specifies one hour after placing as the time for discharge, the shooter moves the hour hand to the figure 1. If eleven, five or eight hours are required, the hour hand is turned to the corresponding figure.

The crystal of the watch is said to be treated so as to prevent it from being shattered by accident and thus to eliminate a possibility of short circuiting from such cause.

The electric wires pass upward from the battery, across the face of the watch, through a perfectly rigid brass conduit, again affording protection from possible discharge resulting from accidental dropping of the mechanism. Surrounding the platinum firing pin and attached to the dial of the watch is a small circular piece of sheet mica—an additional insulating measure.

How the Bomb Is Used

Nitroglycerine is placed in the well in the usual manner. The shooter ascertains the number of hours the producer wishes to elapse—from one to eleven—between placing the bomb and the time of discharge. The watch is given a running test of one hour, and the battery tested by exploding two caps. The container is then filled with dynamite, caps attached, the mechanism placed in the cast-iron shell and lowered to placement on top of the nitroglycerine shells. At the designated time the contact of the hour hand of the watch with the firing pin closes the electric circuit, thus exploding caps and dynamite; the force of this explosion, in turn, detonates the nitroglycerine.

Advantages of the Time Bomb

The time bomb has no outside wires to bridge in the casing as is the case with the electric shot. The cast-iron shell and mechanism are completely shattered at discharge; the largest piece recovered from a well so far has been the cap of the bomb, approximately 2x¾ in. There being no residue of any nature from the bomb itself, there is a consequent free flow of oil and gas after shooting, which has a favorable effect on the sand itself.

There is no danger of a premature explosion damaging the well or casing as frequently happens with the jack and bumper squib. It is said that there has never been a case of a bomb exploding more than three minutes ahead of the time set. The shot and bomb are placed together before the casing is raised; ground that falls after raising the casing cannot prevent detonation. The bomb also affords complete control of the shot by the shooter, and it allows ample time after placing—one to eleven hours—to permit the producer to swab his well or do other necessary work before shooting. Where the electric shot is used, operations of this nature are impossible on account of the wires extending into the hole.

In the eleven months beginning Aug. 1, 1924, the company placed 698 bombs in 676 different wells in Wyoming, Kansas, Oklahoma, New Mexico, Colorado, and Texas. The bomb, it is said, has never failed to detonate the shot; in twenty-one cases the first bomb failed to detonate the shot and a second bomb was placed which was successful; in one case two additional bombs were necessary. In 97 per cent of all cases, the first bomb was successful; in only 3 per cent of all cases did the first bomb fail to detonate the shot, due, as is supposed, to some defect in the watch which developed after placing or to the insufficiency of the force of the explosion. The average time allowed for detonation has been two hours, though many cases are on record where the full time range of eleven hours was commanded.

Perhaps the severest test to which the bomb has been subjected was that of detonating shots in the deep wells of the Tonkawa, Okla., field. The wells in this field averaged 4,200 ft. in depth and shooting them has been a perplexing problem, but necessary, due to fast declining output.

In wells of this depth, the jack squib is not only an uncertain method, but its use is accompanied with the gravest peril to the well itself, as the possibility of a premature explosion damaging casing worth thousands of dollars is increased many fold. Any practical oil man can picture to himself the probability of successfully choosing a fuse of the exact length that would assure explosion of the jack in the proper position after dropping it nearly a mile into the depths of the earth under varying conditions of gas, fluid, and other natural influences.

The electric wire shot offers possibilities, but here the question of initial cost alone is a factor. Moreover, there is the probability that at such depths the wire would break of its own weight or that it would be rendered ineffective from short circuiting due to the buffeting it must withstand.

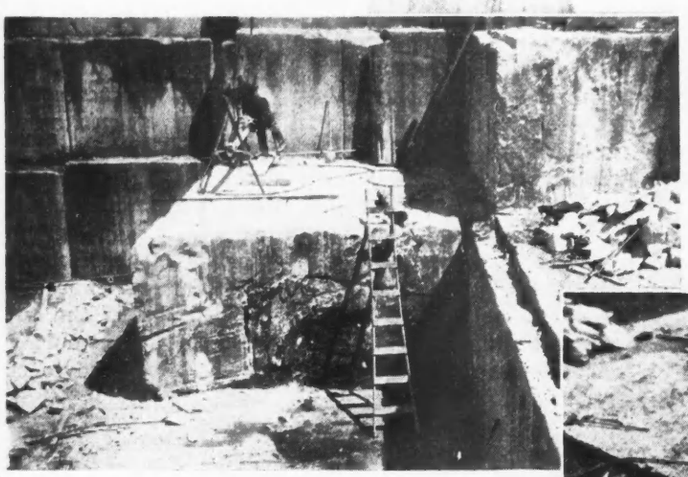
A New Hand Jig Developed in South Africa

A type of jig-pulsator concentrator presenting certain novel features has been designed by J. H. Macadam, of Troyeville, according to the *South African Mining and Engineering Journal*. In essence it consists of a box with a perforated bottom, having a slope of about 3 deg. toward one end. This box is given an up-and-down movement under water by a system of cranks and rods, and to increase the pulsation effect a rubber diaphragm is placed below the screening bottom. The result in operation is to give a discharge of concentrated product both above and below the screen; the fine heavy portion passing through and the coarse material of high specific gravity traveling down the slight slope and being discharged above the screen. The novel points are this double discharge of concentrates, and the employment of the diaphragm.

A small plant, capable of handling about 160 cu.ft. of material per day, has been operated with success on diamondiferous gravels. This plant is hand operated and has given good results, the feature of continuous operation being a distinct advantage. Machines suitable for power drive will be tried out on tin ores in Southwest Africa. There is some doubt as to whether the design can be built in larger sizes while retaining the feature of the rubber diaphragm and obtaining corresponding results.

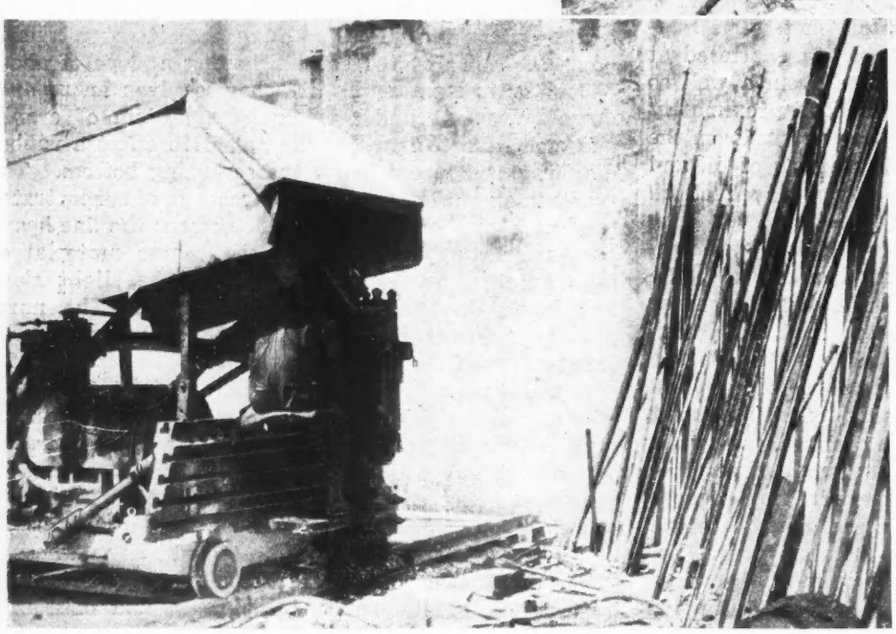
Marble Quarrying at Sonora, California

At right: Drilling a line of holes with plugger drill

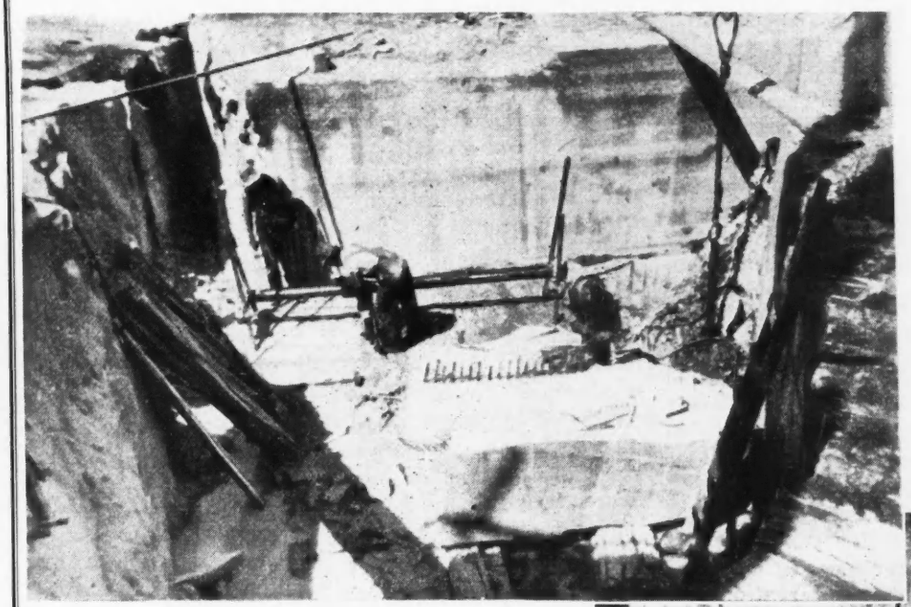


Left: Making side and end cuts. The bed cut is made by drilling a line of holes and splitting

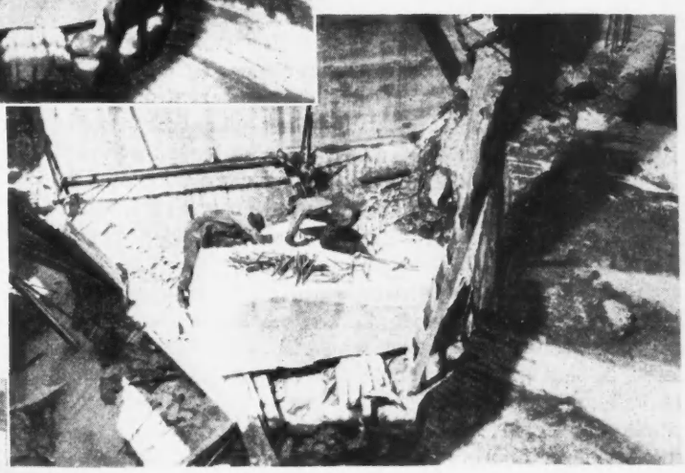
Right: Drilling lines of holes in a large block. The block is split into two or three smaller blocks by plug and feathers



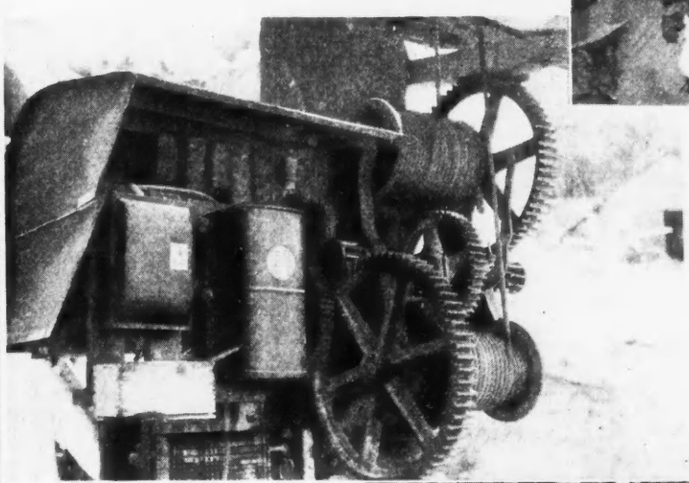
Left: Making a cut with a channeling machine



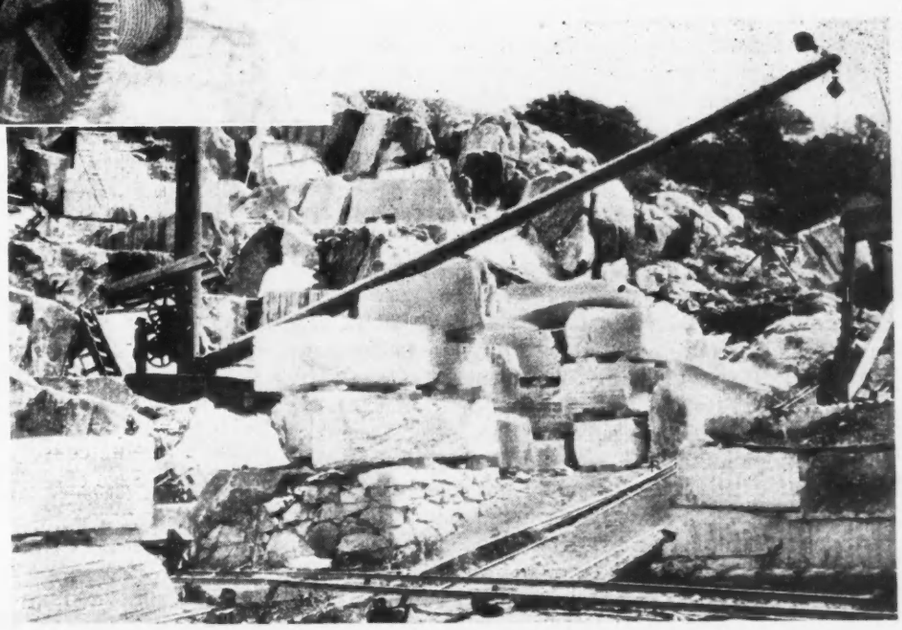
Setting plug and feathers and drilling bed holes—Columbia Marble Co.



Right: Block has been split and plug and feathers are being removed



Side: Compact motor drive for a 15-ton derrick. A 5-hp. motor and spur gearing are used to drive the two rope drums



Right: Blocks of marble are being stacked. They are loaded on cars as required

Discussion

Do Engineers Fear to Be Statesmen?

THE EDITOR:

Sir—The letter of W. E. Greenawalt on "Engineering Education," published in your issue of Sept. 19, broaches many interesting points that have not appeared before in the discussion of the subject, which has been carried on intermittently in *Mining Journal-Press*. His contention that lawyers are everything and engineers nothing, in the leadership of public opinion on social and economic subjects, must arouse wonder as to the why and wherefore of this sad condition from the standpoint of human progress. Any one familiar with the teaching methods of law as compared to engineering schools must be aware that the former still follow traditional knowledge and didactic methods of instruction as contrasted with the system of learning from the observation and correlation of the historical existing phenomena of nature, which prevails in the latter. The legal method is akin to the theological, in that it requires a precedent, looks for some authority, and must find an ancient decision before it can make any plan for present-day use; whereas the scientific procedure of the engineer is to search for the underlying principle of the problem, and on this as a base, and with well-tested materials, erect his structure, irrespective of whether it is akin to one erected by his grandfather or the ancient Romans or not. The scientific procedure, first methodized by Francis Bacon in his "Novum Organum," has been responsible for more progress in the classification of nature and the mastery of physical forces in the last three centuries than was achieved by the legal or empirical method in the previous thirty. Industrial and intellectual stagnation follows the latter when carried to an extreme, as in the case of the Chinese, a naturally brainy race, whom ancestor worship had petrified socially for 2,000 years until aroused from their lethargy by recent European invasions.

I differ from Mr. Greenawalt, however, in his belief that laws are the most important factors for the development of individuals and institutions. This theory is pleasing to the lawyers but quite discordant with the facts, for laws can easily hinder but never originate progress. All that the best of laws can do is to clear the way for the free action of creative spirits among the citizens, because from these must proceed whatever advance one generation makes over its predecessor.

Undoubtedly many engineers are mere artisans in their general outlook on social problems. First, because their school studies were confined to some narrow course in technology and then because they were not of the type to broaden out by further study, in subsequent professional life, their early narrowness. Here, Mr. Greenawalt's suggestion, that the four-year engineering courses should be liberalized and humanized, seems a good one and in line with the ideas of the announced plans for reforming the curriculum in mining engineering at Harvard. The same idea was introduced into my alma mater, Lehigh, nearly a generation ago by Dr. Dunn when he assumed the presidency and found its engineering schedules too specialized and technical.

But want of a general outlook will not account for the lack of public influence and leadership on the part of these thousands of engineers who are mentally more competent than the members of any other profession to solve general economic and industrial problems. Mr. Greenawalt's explanation that the engineers "have no channel of expression" because "engineering societies . . . either tacitly or actually forbid such discussions" seems quite inadequate and partly contradicted by my personal experience. Although two of my articles on debatable economic problems were refused by the A. I. M. E. on flimsy pretexts, one of these was later published in the *Mining and Scientific Press*[1], and the other by its successor, *Mining Journal-Press*[2]. Besides, if the publication committee of an engineering society becomes reactionary or attempts to forbid the publication of any views but the traditional ones on social questions, the members have the very simple remedy of electing a more liberal board of directors, at the next annual election, who will install a different kind of committee. The fact that this procedure is not adopted and that the same censorship continues, year after year, indicates that there is some powerful deterrent to the making of any change, which, as Mr. Greenawalt hints, may be because an engineer is "too closely related to his job to permit much freedom of thought or expression." This seems to imply that the motive for non-persistance is *fear*.

Without offering any personal opinion on this delicate question, I believe that any sincere engineer must realize that, however safe he may be personally in the continuance of his means of livelihood, and whatever his political opinions, the same cannot be true in the case of many of his professional brethren. In an overcrowded profession with practically no legal protection, as in Europe, to guard him from the unfair competition of empiricists or impudent charlatans, the American scientific engineer is in a peculiarly helpless condition, dependent as he is, in so many cases, on employment by organizations of a predatory nature, to whom economic reform would mean the loss of huge profits. While his mental training and observing powers enable him to penetrate readily the nature of the unfair legal privileges on which his employer may be thriving, woe will blast him professionally should he dare to give out his special knowledge to the despoiled public in an endeavor to do his duty as a progressive citizen in the moral sense! There is only one other class of professional workers to whom engineers can be compared, and that is college professors, who have to put in the *index expurgatorius* whatever topic their plutocratic or machine-politician boards of trustees may suggest. Occasionally a daring professor kicks off his mental leading strings, and, if he is clever enough to obtain proof of the real reason for his consequent sudden dismissal, he will see "Another Case of College Coercion" or "A New Blow at

[1] "Natural Taxation of Mineral Land," *Mining and Scientific Press*, Oct. 30, 1915, p. 674.

[2] "Subsoil of Mexico and Art. 27," *Mining Journal-Press*, Vol. 115, p. 279; "Freedom of Discussion in the Institute," *Mining Journal-Press*, Vol. 114, p. 1,063.

Freedom of Teaching" featured in all the daily papers as a partial compensation for his eviction.

Should an engineer lose his job for a similar reason he would discover that the press took no interest in his case, and later he might find it difficult to procure other employment, as martyrs for economic opinion are little more in favor among most company directors of our time than were Nazarenes among the rulers of Cæsarian Rome. Indeed, the engineer's present plight is worse than that of an artisan, for a bigoted employer will think twice before attempting to bulldoze the latter, since such action may result in a costly strike on the part of his trade union, risen in defense of a persecuted member. And the engineer's weakness is even more pitiable when compared with that of the lawyer, because the latter has his bar association, comprising in its membership not only corporation lawyers, who know all the dangerous secrets of malefactors of great wealth, but judges, before whom such secrets might come for consideration should any malefactor get too arrogant with his attorney. Moreover, the average lawyer is, unlike the engineer, a trained writer and orator, and thus possesses the talents needed for obtaining, unaided, a full ventilation both in press and on platform of the perverse practises of his intolerant whilom employer.

Perhaps enough has been said to show Mr. Greenawalt that more than a different education is needed before an engineer can safely aspire to statesmanship. How his present defenselessness may be altered in the future no one can foretell. It may be by the development of a hard shell in the form of an independent fortune, like the individual protective armor of the Jurassic reptiles; but the danger of such a plan will be that it takes so long to execute that, meanwhile, its original object may be nullified by the lethargy of old age or the increase of selfishness due to the ardent pursuit of wealth. Or the alteration may come about by the union of his individual weakness with that of his fellow engineers, so as to form an organization formidable for either attack or defense.

R. B. BRINSMADE.

Mexico City.

Atomic Structure and Flotation

THE EDITOR:

Sir—In reply to J. W. Gruner's letter in your issue of Oct. 10th, in which he discredits the present possibility of utilizing crystal structure diagrams to explain flotation, it seems to me that he rather missed the point which I tried to bring out in my article of Sept. 12th, entitled "An Explanation of Flotation Based on X-Ray Data." In my article, the statement is made that "sulphur and the metals have an affinity for oxygen and therefore so will the surfaces which they form." Such being the case, it is immaterial, so far as the metallic sulphides are concerned, whether they fracture along a crystal surface or not, for whatever surface is formed when they are broken, that surface must have an affinity for oxygen.

As Mr. Gruner does not seem to like the possibility of utilizing space-lattice diagrams to explain the relative non-floatability of the oxides, let us consider this class of compounds from the standpoint of their chemical composition. That such minerals as $CaCO_3$, SiO_2, and CuO would fracture to produce surfaces which would contain only metal atoms, and consequently possess some affinity for oxygen, is surely not of the same order of probability as is found in the case of the metallic sulphides in which all the atoms present in the compound possess an affinity for oxygen. Moreover, even if the oxides were to fracture to produce surfaces which contain only metal atoms, the modifying influence of the oxygen atoms lying immediately within those surfaces would have to be considered. This involves the question of the radius of atomic influence and residual valence of the atoms concerned, points which have been discussed very fully by Dr. Langmuir in his articles on "The Constitution and Fundamental Properties of Solids and Liquids," which appeared in the *Journal* of the American Chemical Society, Vol. 38 ii (1916) and Vol. 39 (1917), p. 1849.

I should also like to state that Mr. Gruner's objections were among the first to be considered when the variations between the space-lattice diagrams of floatable and non-floatable minerals were examined, but, for the reasons just given, I do not think that they disprove the suggestion that floatable minerals are those which have a greater attraction for oxygen than those which are relatively non-floatable. It might also be noted that the possibility of using a foreign gas which would be adsorbed as a gas film at the surface of minerals which we now consider non-floatable, so as to render them floatable, should not be overlooked.

A difficulty, not mentioned by Mr. Gruner, which at first sight may seem rather harder to explain, is that which is met with when one tries to account for the deadening effect produced on certain sulphides by the use of sodium and potassium cyanide. The recent work of Messrs. Tucker and Head, and Gates and Jacobsen, whose papers were brought before the American Institute of Mining and Metallurgical Engineers at the September meeting just held at Salt Lake City, have placed almost beyond doubt the fact that minerals so deadened are coated with a film which contains the CN group. If, however, it is borne in mind that this group has a marked affinity for sulphur and metal atoms, and very little for oxygen, its value as a deadening agent can be explained, as consequently the residual valence of the metal atoms which are combined in the metallic cyanides formed will be tied up with the CN group, and as that group has little affinity for oxygen, neither will the surface of which it forms a part.

It might also interest Mr. Gruner to know that recently, in dealing with a problem of differential flotation, I made use of the hypothesis that due to the variation in the structure of the sulphides concerned, certain reagents should produce a greater deadening effect upon one of them than upon the other, and that the reagents so selected resulted in a very marked differential action being obtained, which was in accord with the theory that had been formulated. To be sure, this result may have been purely a coincidence, but it nevertheless suggests that atomic structure and the affinity hypothesis should not be discredited quite as readily as Mr. Gruner suggests.

The objections raised by Mr. De Jong in the issue of Oct. 24 are in the main also covered by this letter. As far as the accuracy of the atomic arrangement of chalcopyrite and sphalerite was concerned, the diagrams in question were developed by well-known authorities on this class of work, and the reasons for the groupings selected will be found in their original articles to which reference has been made.

C. G. MCLACHLAN.

Britannia Beach, B. C.

News of the Week

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Summary

MINING INDUSTRY of California demanding change in state's method of taxation; gross inequalities cited—Lower state taxes in sight for Michigan.

Petition filed to reopen Carson patent suit—Tonopah-West End Extension hearing set for Jan. 11, 1926.

Encouraging tests made on black sands of Graham Island, B. C.—Kafue Copper operates gold dredge.

Joplin district has 166 mills in operation; weekly production is 20,000 tons lead and zinc concentrates.

Mining conditions normal at Tonopah—Betty O'Neal increases extraction efficiency.

Director named for U. S. Bureau of Mines, subject to confirmation by Senate.

Anaconda earning approximately $7 per share, with Butte mines operating at 75 per cent capacity; fabricates practically all copper it produces.

High price of tin stimulates mining in Cornwall, Nigeria, and Bolivia—Rhodesian asbestos in demand—Proposed platinum combine in London.

United States Copper Mining Co. incorporates; controls 1,380 acres mineral land—Tennessee mine, Chloride, Ariz., to be in operation soon.

Comstock Merger makes record production—Idaho-Maryland group, Grass Valley, Calif., passes to holding company.

Ajax Mining Co., Burke, Idaho, entering upon extensive development program.

Agitation for Change in Method of Taxing California Mines

Gross Inequalities Cited—Under Present System, Ores of Less Than $6 on Mother Lode Cannot Be Mined

Recent meetings of mining men in northern California have brought out instances of inequitable taxation of mining properties. Mine taxation is handled by county assessors, and no special distinction is made with other property. C. E. Jarvis favored the taking of mine taxation away from the county assessors and placing it in charge of the State Board of Equalization, which would adopt a uniform system of assessing mining properties. Arthur B. Foote cited an instance where farming lands owned by his company were assessed at $200 per acre, whereas similar land adjoining was assessed at only $50 per acre. A. S. Howe, of Sutter Creek, instanced the case of a mine in Amador County, which was assessed at $26,100 in 1918 when it was operating and at $65,500 this year, although it was closed down, filled with water, and the surface plant had been dismantled. Howe pointed out that where it formerly cost $3 per ton to mine and mill Mother Lode ores, it now costs about $6 per ton.

Additional burdens carried by the gold mines were listed as follows: workmen's compensation insurance, 24c.; increase in taxes, 37c.; increase in power rates, 24c.; extra war taxes, 15c.; total, $1 per ton, in addition to higher prices for materials and labor. It is now necessary to mine ore of $6 to $7 per ton in value. The average Mother Lode ore ranges from $4 to $6 per ton. As a consequence most of the gold mines are shut down.

The law taking away from the counties the taxes collected from corporations, the principal source of income of the foothill counties, and giving it to the state, is the principal cause of the great increase in taxes levied upon mining properties. A. B. Foote instanced the fact that the Empire and North Star mines are paying approximately one-fifth of the Nevada County taxes. Lower costs of government and more equitable distribution of the tax levy are considered necessary if the mines are to be operated.

Tonopah-West End Extension Hearing Set for Jan. 11, 1926

THE hearing of the apex suit between the Tonopah Extension Mining Co. and the West End Consolidated Mining Co. and its subsidiary companies, the West End Extension and the Tonopah "76," has been set for Jan. 11, 1926, in Goldfield. The hearing has been delayed for many months due to necessity for extensive development work in order to present the facts properly, and it is expected that this work will be far enough advanced by that date so that the trial can begin without further delay. The case will be heard before Judge Emmett J. Walsh of the district court at Goldfield.

Joplin-Miami District Has 166 Mills in Operation

Weekly Production 20,000 Tons of Zinc and Lead Concentrate—Tri-State Operators Elect Officers

In response to steadily advancing zinc prices, the Joplin-Miami district is recording the greatest activity in its history. For the week ending Oct. 24 a total of 166 mills were in operation, and production established a new high record, with 16,851 tons of zinc concentrates and 3,141 tons of lead concentrates.

Despite the feeling in the district that overproduction is likely to result, numerous properties have turned once more to night-shift operations, thirty-two being reported with such activity during the week mentioned above. If this tendency becomes any more pronounced, production will advance toward 18,000 tons per week, it being already quite close to 17,000.

The foreign demand for zinc is the cause of this unprecedented activity, and every operation is endeavoring to make the most of it.

Officers Elected

At the annual meeting of the directors of the Tri-State Zinc Lead Ore Producers' Association, in the Joplin-Miami district, J. F. Robinson, of Miami, Okla., was re-elected president. Other officers chosen were: C. F. Dike, Joplin, first vice-president; S. H. Davis, Baxter, second vice-president. George Pearson, Miami, treasurer; J. D. Conover, Joplin, secretary. The executive committee will consist of Robinson, Dike, F. C. Wallower, and Frank Childress, of Joplin, and T. F. Coyne, of Webb City, Mo.

Conditions at Tonopah Normal

Tonopah production rate continues about normal. The Tonopah Extension production was valued at $95,965 for September, and operating loss was $5,050, which indicates improvement over recent months. Bullion shipped as representing results of first fifteen days' operations in October was $47,500, which is at the same rate as in September. The mill is treating about 250 tons of ore per day

The Rescue Eula Mining Co. has suspended work on the 1,200 level, after limited crosscutting had failed to disclose the downward continuation of the 1,100 level oreshoot in the Green Vein. Winzes have been started from the 1,100 level on both the Green Vein and the Anderson Vein. Both winzes are starting in good ore. The ore will be shipped to the West End mill. Work will be resumed on the 1,200 level when the development has progressed far enough to indicate the location of the oreshoot at this elevation.

The Tonopah Divide Mining Co. has started crosscutting north from the bottom of its 300-ft. winze from the 1,600 level of its Midway mine, and good progress is being made.

Kafue Copper Development Co. Operates Gold Dredge

Charles A. Banks, consulting engineer for the Kafue Copper Development Co., has given out the following information about the operations of the company's dredge, Kafue No. 1, on Antler Creek, in the Cariboo district of British Columbia.

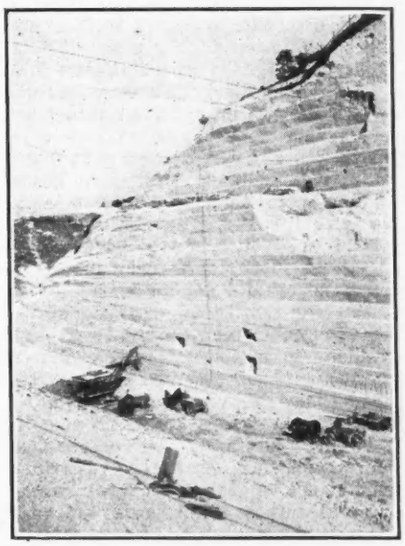
"The dredge was built, the machinery installed, and the completed unit turned over to the company in December, 1924. A trial run demonstrated that the machinery was satisfactory, and then operations were closed on account of the severe frost. The dredge was started in April of this year, and has handled between 60,000 and 70,000 cu.yds. per month. (It is designed for 60,000 cu.yds.) Operations until Aug. 20 were almost wholly in ground that had been worked in the early days. Since June 1 we have been paying our way. On Aug. 20 we got out of the old workings, and since then have been taking out roughly $750 per day. Our monthly costs are about $6,500, or, say 10c. per cu.yd. Twenty-seven men are employed under C. W. Moore."

Tennessee Mine Ready to Begin Development Soon

The construction work now being carried on at the Tennessee mine at Chloride, Ariz., is expected to be complete about the first of the year. The timbers for the new headframe have all been cut and are ready to be put in place. The changing of the electrical equipment to permit the use of three-phase current in place of the one-phase current which is used at present is nearly complete. It is understood that a new electric hoist is to be installed. The construction work is being done in preparation for a development campaign that is to be carried on in several levels of the mine.

Petition to Reopen Carson Patent Suit

The American Smelting & Refining Co. has applied to the U. S. Circuit Court of Appeals at San Francisco for permission to petition the U. S. District Court at Seattle to reopen the Carson case, which was originally tried before this court. The Seattle court dismissed the suit for infringement of Carson's reverberatory patents, but the Circuit Court of Appeals reversed the Seattle court and denied the A. S. & R. Co. a rehearing. Appeal to the Supreme Court resulted in favor of Carson. The present action for a reopening of the case is based upon the discovery of new evidence. The case will be heard in the near future by the Court of Appeals.



Diatomite deposit, Lompoc, Calif., operated by Celite Products Co.

Betty O'Neal Increases Extraction by Improving Process

Improved concentration has raised the value of concentrates and improved extraction at the Betty O'Neal mine, near Battle Mountain, Nevada. One carload of 43 tons, shipped the latter part of September, netted $16,053. Values per ton were as follows: gold, .03 oz.; silver, 567.7 oz.; copper, 2.95 per cent, and lead, 10.15 per cent.

Concentration improvement is reported to be due to the addition of a small quantity of potassium xanthate as a flotation reagent, with the result that a much closer concentration is now being made than formerly.

Brewer Group of Claims, Butte, to Be Developed by Idaho Capital

Idaho operators, headed by Craig and La Fountain, are making an examination of the "Brewer" group of claims, lying close to the Nevin-Frank plant, about one-half mile south of Butte, Mont. The property has been developed intermittently by leasers and a consistent vein of medium-grade silver ore has been opened a few feet in depth. It is said to be the plan of the Idaho group to develope the property thoroughly, the initial program calling for a shaft to be sunk to a depth of 600 ft.

New Orebody at Mammoth Mine

Discovery of a new orebody in the Mammoth mine, one of the oldest mines in the Tintic, Utah, district puts an altogether new aspect on the outlook for the property which several years ago was believed to be worked out. Shipments are averaging about ten carloads weekly.

The new orebody is 1,500 ft. east of an ore zone which has been productive for fifty years. On the 2,100 level five ft. of high-grade mineral has been opened with the limits not yet in sight. On the 1,500 level the stope shows ore 30 ft. wide and 30 ft. thick.

Ajax Mining Co. Plans Deep Development

The Ajax Mining Co., near Burke, in the Cœur d'Alene district, Idaho, will soon enter upon a deep development program in accordance with the recommendations submitted by Oscar Hershey, a geologist for the Bunker Hill & Sullivan Company. The Ajax is developed by series of tunnels, the lowest one being a crosscut over a mile long, which cut a large body of lead-silver ore.

The Ajax was the scene of a serious disaster four months ago, caused by water in the upper workings breaking through a raise that was being extended from the lowest tunnel level. Four men were killed, and although the Ajax management exerted every effort to clean up the wreck and recover the bodies of the men, only two have so far been found. As fast as the debris is removed, the caving continues, making the work both difficult and dangerous and presenting what appears to be an endless task.

Much of the material broken down by the water is solid galena, frequently in large chunks that have to be broken. From this wreck the company has taken and shipped three carloads of high-grade ore, one of which contained 79.8 per cent of lead, the richest lead shipment, with one exception, ever made in the district.

Encouraging Tests on Black Sand of Graham Island

Charles T. Cabrera, manager for the Tretheway-Tough syndicate, of Toronto, gives the following account of the test experiment of cyaniding the black sand on Rose Spit, on the northeast shore of Graham Island, the northernmost of the Queen Charlotte group:

"Between Sept. 26 and Oct. 6, 72 tons of sand was dug from the shore, screened, and the resulting 48 tons of screenings was cyanided in vats and produced 3.83 oz. of gold. The cost of reagents, sodium cyanide, caustic soda, and zinc; was only 9.25c. per ton."

The cost of screening, filling, and emptying vats was not given, as in the crude experimental plant it would not be comparable with what could be accomplished in a properly designed plant.

The syndicate plans to erect a commercial plant on Rose Spit in the spring. In the meantime, a similar test will be made on gravels from placer leases that the syndicate owns on the Skeena River, near Hazleton, B. C.

News From Washington

By PAUL WOOTON
Special Correspondent

Scott Turner Chosen as Director of Bureau of Mines

Scott Turner, of Lansing, Mich., has been selected for the directorship of the U. S. Bureau of Mines. As Congress is not in session, he has been given a recess appointment by President Coolidge. He is expected to assume his new duties Dec. 1. The White House statement announcing the appointment reads, in part as follows:

"The appointment of Mr. Turner was made on the unanimous recommendation of the Advisory Committee from the mining industry recently appointed by Secretary Hoover and composed of representatives of the American Institute of Mining and Metallurgical Engineers, the American Mining Congress, the National Coal Association, the United Mine Workers, and the American Petroleum Institute. In reporting to Secretary Hoover, J. V. W. Reynders, chairman of the Advisory Committee, wrote as follows: 'It is believed that the appointment of Mr. Turner will conserve the ability of the various divisional heads in the tasks to which they have been devoting themselves and promote the forward-looking plans which you have in mind for the extension of the Bureau's service in the economic and industrial development of the country.' "

In recent years the view has come to be strongly held in the government service that the principal places should be filled by promotion. It is felt that in nearly every instance men can be found on the staff of a bureau who are thoroughly capable of assuming leadership. By and large, it is contended, officials thus chosen are in a position to do more successful work than those selected from the outside. There is the additional advantage that such procedure would make the government service more attractive, whereas the constant selection of outside candidates for the best positions tends to destroy the *esprit de corps*.

Sentiment of this character has not been lacking in the Bureau of Mines since the resignation of Director Bain. Dr. Dorsey Lyon, the acting director, had impressive support for the directorship, despite the fact that it was well known that administrative duties are distasteful to him and that he wants nothing more than to be allowed to continue the research program he has in progress at the experiment stations.

It was recognized, however, within the Bureau that the situation possessed unusual features. The Bureau had just been transferred to the Department of Commerce. One of the reasons for the transfer was to bring the producers of minerals into closer touch with the consuming industries. One of the policies on which Secretary Hoover has been most insistent is that industry indicate the services of which it is most in need. A new relationship with industry was called for. One of the steps thought necessary to impress everyone with the new order was to place the Bureau under the immediate direction of an operating man who was to be chosen from the active service of industry.

Since the Advisory Committee, representative of the producers of coal, metals, oil, other minerals and of mine labor, had found such a man, who also had a thorough grasp of the technical features of the Bureau's work, most of the objection to an outside appointment was removed. The committee's selection is generally regarded as a happy one. It is believed that Mr. Turner will bring to the Bureau a relationship with industry that could not have been secured otherwise. At the same time it has been made very plain that the committee did not go outside of the Bureau for a director because of any lack of capable men on the staff. The President in announcing Mr. Turner's appointment did an unusual thing in bringing out this very point.

Mr. Turner was selected from a list of twenty names. The choice was unanimous. Mr. Turner's experience included the operation of coal as well as metal mines and service at mills and smelters. He had been associated with mining enterprises in various parts of the world. In addition he is a man of independent means. This has an important bearing on the service a Bureau chief can render. The salary allowed by the government to these ambassadors of industries and other great national activities is less than half that allowed comparable posts in the diplomatic service. The requirements of such a position in Washington call for expenditures far in excess of the salary.

Arizona Opposes Hydro-Electric Plant on Colorado River

The upper basin states of the Colorado River have filed a protest with the Federal Power Commission, objecting to the granting of a license for the construction of a water-power project at Diamond Creek to the Colorado River Engineering & Development Co. In this they are aided by the State of Arizona and private interests.

The Diamond Creek project permit was originally issued to James B. Girand, who is said to have assigned his interests to the Colorado River Engineering & Development Co., which corporation is reported to be controlled by mining interests in the State of Arizona.

In filing its protest, the State of Arizona also made application, on behalf of the state, for permission to construct a dam at the Bridge Canyon site. The proposed development at Bridge Canyon calls for a dam across the river above Lee's Ferry, to utilize "the entire flow of the river for power development at this site, and to appropriate the water stored not heretofore appropriated for beneficial use."

The protest against the issuance of a permit for a dam at the Diamond Creek site recites a large number of "legal, engineering, and economic" reasons why the project would be inimical to the best interests of Arizona.

It is declared also that elimination of the Diamond Creek permit will clear the way for a comprehensive development of the river according to economic principles.

Development of Colorado River Power Projects Held in Abeyance

All development of the water resources of the Colorado River and its tributaries, including the Gila and every other stream in the basin, is to be suspended until the seven states concerned can agree. The determination to take this action, it is presumed, took place at the Cabinet meeting on Oct. 27. In the resolution the opinion is expressed, "that constructive governmental policy requires that the states affected should, and they hereby are earnestly urged to, reach as speedily as possible an agreement among themselves for the division of the waters of the river system, all to the end that thereupon development may proceed unchallenged upon interstate grounds."

Proposed Platinum Combine in London

A great combine to establish a platinum market in London is being planned, according to London press reports which are quoted in a report to the U. S. Department of Commerce. Negotiations have been taking place recently with a view to handling all sales of South African platinum, but as no mines have been opened there, a definite plan for sales operations has not yet been completed.

Since the Russian revolution the supply of platinum from that source has been almost entirely cut off, and as Russia satisfied a considerable part of the general demand the change has had a marked effect on the market. The world production of platinum is small, making the report of extensive deposits in South Africa an important one. At present most of the world's platinum is produced by Colombia, which has an annual output of about 37,000 oz., representing a value of £500,000. Platinum is also found in Britsh Guiana, Canada, and Madagascar.

New Mercury Mine in Texas to Open Soon

Quicksilver production of the Terlingua district, Texas, will be increased soon by the opening of a mine owned by E. A. Waldron. Work of blocking out cinnabar ore in the mine has been in progress for some time. A large quantity of good ore is said to be now ready for the furnace. While developing this mine a cavern 100 ft. long, 75

ft. wide and 75 ft. high was encountered, the walls of which are encrusted with cinnabar.

The mine and furnace of the Chisos Mining Co., which have been in regular operation for about a quarter century, are maintaining their usual production. This company has produced more than 100,000 flasks of quicksilver.

Several other cinnabar mines in this district which were formerly worked may be reopened soon. The fact that the district is 80 to 100 miles from the nearest railroad makes the cost of transporting supplies and quicksilver so heavy that some of the mines have not been able to operate at a profit. The proposed extension of the Kansas City, Mexico & Orient will pass within about 30 miles of Terlingua, and it is possible that a branch line may be built to the mining district.

New Company Acquires Idaho-Maryland

At Grass Valley, Calif., the Idaho-Maryland group, which was operated by the Metals Exploration Co. and which reverted to Errol MacBoyle and his associates when the Metals Exploration lease was discontinued, has been acquired by the Idaho-Maryland Consolidated Mines, Inc., a Nevada incorporation, with E. L. Oliver as president, and F. W. McNear, vice-president. The company is to be a holding company, and operation of the group will be under the old Idaho-Maryland Mines Co., of which Errol MacBoyle is to be president and manager. The company controls claims measuring about two miles along the Idaho-Maryland vein system. The new company plans to extend ore transfers to the 2,000 level and thus deliver the ore directly from them to the main working shaft.

The Brunswick mine, east of the Idaho-Maryland, is reported to have ore on three levels and to be operating its milling plant two shifts per day. A crew of from thirty to forty men is employed.

United States Copper Mining Co., of Clifton, Ariz., Incorporated

The United States Copper Mining Company was recently incorporated under the laws of Arizona by A. L. Terry, Harvey T. Grady, and M. E. Crawford, of Greenlee County, that state. The company proposes to take over three important groups of mining claims in one of the best mineralized districts in the state.

The claims in question comprise the Detroit group of twenty-six unpatented claims, the Leszynsky group of eighteen patented claims, and the Novo group of nineteen unpatented claims, all contiguous property embracing an acreage of 1,380 in the Clifton-Metcalf district.

Under the permit, the company is authorized to purchase the Detroit claims and the options on the other two groups in exchange for stock, and to sell and issue 500,000 shares of treasury stock at $2 per share, the commissions not to exceed 20 per cent.

William A. Clark Estate in Arizona Valued at $1,346,509

APPRAISERS of the estate of the late Senator William A. Clark have found only $1,346,509 subject to Arizona inheritance tax. Senator Clark's holdings consisted principally of stock in various subsidiaries of the United Verde Mining Co. The stock in the mining and smelting company, valued into the millions, is owned in New York and at Butte, Mont., and is therefore not subject to taxation in Arizona.

Anaconda Earning Approximately $7 per Share

Butte Mines Operating at 75 Per Cent Capacity—Copper Cost 9¼c. per lb.

The earnings of the Anaconda Copper Mining Co. and its subsidiaries are at the rate of about $6.50 a share on its 3,000,000 shares outstanding after depreciation, bond interests, and taxes have been deducted, or, around $7 a year with earnings prorated from subsidiaries, as is the custom in calculating the earnings of copper companies.

With Kennecott planning to go on a $4 a year basis in November, it is probable that Anaconda will go on a $4 basis in December. Anaconda earned its full year's dividend requirement in the first six months, after deducting depreciation, six months' interest, and setting up tax reserve. Earnings for the second half year are at a higher rate, with outlook notably good for the next few years.

American Brass business is 25 per cent greater than last year, so that thus far this year American Brass Co. and Anaconda's Great Falls wire and rod mill have turned out practically as large a poundage in the first nine months of this year as in all 1924. This plant fabricates 25 per cent of the world's copper production. With all manufacturing plants operating much nearer capacity than at any time since the war, the margin of profit has been greater this year than last. Consequently American Brass earnings for the first nine months, together with those from the Great Falls plant, are probably greater than for the whole of 1924.

Even with the copper output of the Butte mines only 75 per cent of capacity, production is at the rate of about 18,000,000 lb. of copper a month from the company's own mines and 3,000,000 lb. from custom ores. The price of copper is about 1¼c. a pound greater than in 1924. Cost of producing copper is about 9¼c. or about 1¼c. a pound lower than in 1924, making profits per pound of copper fully 2½c. greater than in 1924.

Zinc Activities

The Great Falls plant has been producing over 15,000,000 lb. of zinc a month, so that net production after return of 7 per cent as dust for re-use in the process will probably be 20,000,000 to 25,000,000 lb. greater this year than in 1924.

For the first time since the war, every department of Anaconda's many activities is showing profits, and many of them far the best except during the war. Beginning with 1926, the industry, and Anaconda Copper Mining Co. especially, is entering on what undoubtedly should be a decade of record prosperity in copper.

While it is difficult to apportion Anaconda's earnings, it is probable that, assuming earnings in 1925 of $30,000,000 before bond interest, but after depreciation and taxes, the various departments will net approximately:

Butte mines, 240,000,000 lb. of copper	$12,500,000
Great Falls zinc refinery, 180,000,000 lb.	2,750,000
Great Falls rod and wire mill	750,000
International Smelting	1,500,000
Dividends from subsidiaries	6,500,000
American Brass Co.	6,000,000
Total	$30,000,000

This would make Anaconda's Butte copper operations represent slightly over 40 per cent of the total net income before bond interest, subsidiary dividends slightly over 20 per cent, zinc refining 9 per cent, and Great Falls and American Brass manufacturing earnings 22½ per cent of the total.

Among some of these other activities is development of the Andes property in Chile, which, while it will not be nearly so large a producer as Chile, promises to be one of the cheapest major producers of copper. Good progress is being made in preparing the mine for stoping operations, and at the smelter site, but it will be at least two years before the smelter will be ready for operation. Chile Copper is producing about 18,000,000 lb. of copper a month. Good progress is being made at that property in preparing for increasing its output about 40 per cent. This increase in capacity will not be available before another year.

Lower Taxes in Michigan

Mohawk to Equip Entire Mill with Regrinding Units

Mines of the Michigan district will benefit somewhat from lower taxes this year. Both state and county taxes in Houghton County are the lowest in years. Shipments of copper by boat out of the Michigan district in 1925, to date, have been 14,000,000 lb. greater than in 1924.

In the stamp mill of the Mohawk Mining Co., in the Michigan copper district, three of the four heads are now equipped with regrinding units and it is expected the remaining unit will have been installed by the end of the year. Not all of the tailings of the mill are reground, but those containing a comparatively high percentage of metal are treated, returning better than 1 lb. of copper per ton. Mohawk's losses are about as low as any in the district, not more than 4½ lb. per ton.

Production now is well under way in No. 15 shaft on the Osceola lode of Calumet & Hecla Consolidated. Daily production is from 800 to 1,000 tons, approximately the same as that obtained from No. 14 shaft.

Park Eastern Takes Bond and Lease on Glenallen Mine

A bond and lease on the Glenallen mine, on the east limb of the Park City anticline, 3,000 ft. south of the Park-Utah mine, at Park City, Utah, has been executed to Los Angeles and New York capitalists headed by J. S. Tremayne. Lessees have bound themselves to pay the indebtedness of the Glenallen Mining Co. and to turn over a considerable sum to be divided among the stockholders.

A new company, the Park Eastern Mining Co., has been organized, with a capitalization of $3,000,000 divided into 3,000,000 shares. The Glenallen company will receive 1,200,000 shares, to be exchanged with stockholders on the basis of one share of Park Eastern for two of the Glenallen.

Shipments of the zinc-lead ore from the 2,400-ft. tunnel are to begin soon. W. C. Rennels, formerly manager of the Britannia Copper and the Hayes-Monnette lease at Goldfield, will be in charge of operations.

Jib Consolidated Mill Working at Full Capacity

The mill of the Jib Consolidated Mining Co. at Basin, Mont., is working practically at capacity on the tailings from the old dump and is realizing a profit which is more than sufficient to pay expenses. Work is also going ahead on the sinking of the new shaft. Mining men express the opinion that the future of the property depends on the results attained from the new shaft sinking. Fred L. Melcher, the trustee, under whose management the property is being operated, is acting for the Western Iron Works, which bought the property in at sheriff's sale on claims amounting to $225,000.

Lizzie Lode, Butte, Operated by Leasers

George Eckerle, John L. Jones, Ronald Maden, and Reuben Hall have obtained a lease, from the Hickey estate, on the upper portions of the vein on the Lizzie lode, situated on East Park St., a few hundred feet east of the business section of Butte, Mont. Operations have been confined to drifting on the 100 level and driving a crosscut north to tap a parallel vein. Leasers are shipping about one car per week, the ore containing substantial amounts of copper and silver. Additional machinery will be installed, a contract having been given to the Butte Machinery Co. to furnish boilers, a steam hoist, a compressor, and a pump.

Hercules Leases the Old Alice Mine, Near Wallace

The Hercules Mining Company, of Wallace, Idaho, has taken a lease and bond on the old Alice mine. This property, which, twenty-five years ago, was expected to become eventually a great mine, was developed extensively both by tunnel and a 1,600-ft. shaft, and a mill of 125 tons' capacity was erected. Considerable ore was found and shipped, but the ground was badly broken.

Bingham Metals Ship Fifteen Cars of Ore From New England Mine

Rehabilitation of the old New England mine, at Bingham, Utah, surrounded by the Utah Copper, the United States, and the Utah-Delaware or old Utah Consolidated mines, has been rapid since the Bingham Metals Co. acquired the property. During the first twenty days of October, fifteen carloads of ore were shipped. During November the company expects to ship from 1,000 to 1,200 tons.

Operations are being confined chiefly to the 680 or bottom level. The company plans to sink to the 800 level, where the intersection of three important veins should be found.

Star District, Near Milford, Utah, Has Two Ore Discoveries

Discovery of ore in the Moscow Silver Mines and the Maud S. of the Utah Premier Mining Company, near Milford, Utah, is focusing attention of Utah mining men on the old camp, which is in the Star district. While the strike in the Maud S. is the more sensational, that in the Moscow is more important, because it tends to prove that the mineralization of the district does persist to depth.

Production in the Moscow mine from development work alone is averaging three carloads weekly of lead ore averaging from $30 to $40 a ton. This work is of great importance to the district in that it is being carried on 1,100 ft. below the surface.

Pulling up of a sagebrush to start a fire brought about the strike in the Maud S. claim. Sinking of a prospect shaft proved that the mineralization improved with depth. In sinking 80 ft. the company has taken out four carloads of ore. The first two netted about $2,200 each.

New Candelaria Shuts Down Temporarily

The New Candelaria Mines Co., which has been operating at Candelaria, Nev., is again in financial trouble, and mine and mill have been temporarily shut down. A special stockholders' meeting has been called to consider the proposal to make the company's stock accessable, and thereby provide a means to pay current debts and to finance mine development. The company owes about $10,000, of which $5,000 is in the form of a note, falling due March 1, 1926, in favor of the Mineral County Power Co.

Rawley Mine Resumes Operation

After two years of idleness, the Rawley mine, near Bonanza, Saguache County, Colo., is to resume production. The mine is equipped with a modern mill and a tramway seven miles long, which delivers the concentrate to the Rio Grande Railroad at Shirley.

The equipping of the mine with mill and tram was through a joint financing in which the American Smelting & Refining Co., the Metals Exploration Co., and the Stearns-Roger Co. were the contributors.

Utah-Apex Opens New Orebody and Improves Mill

Copper ore has been discovered on the 2,400 level of the Utah-Apex mine, at Bingham, Utah. Dimensions of the deposit have not been determined. The shaft is nearing the 2,400 level.

Improvements in the mill for zinc separation are nearing completion. Zinc recovery should begin by the first of November. Earnings of the company have suffered a reduction in consequence of the controversy with the Utah Delaware Mining Co., formerly the Utah Consolidated, a subsidiary of the International Smelting Co., regarding an orebody developed several months ago. Through an agreement with the Utah Delaware, exploitation of the disputed orebody has been withheld pending a settlement of the question of ownership. Representatives of the two companies are investigating conditions for the purpose of arriving at a settlement out of court.

San Jose Mines, at Nacozari, Under New Management

Merrill H. Berry recently returned to Nacozari, Sonora, Mexico, and has taken charge of the San Jose mines, northeast of that town. These mines were discovered and developed by Reardon and Suits, who pioneered in the milling of custom ores in this district about forty years ago. Later the mines were taken over by the present owner, George S. Montgomery, of Oakland, Calif. The mines have been under lease the greater part of the time and have produced gold-silver ores that were shipped to the Copper Queen smelter at Douglas.

Canario Copper Co. May Build Railroad

The Canario Copper Co., operating 10 miles west of Nacozari, Sonora, Mexico, has under consideration the construction of a 10-mile railroad to connect the mine with the main trunk line at Nacozari, and also the installation of the first unit of the mill, which it is expected will be 1,000 tons. The management expects to call a stockholders' meeting in the near future to discuss these important considerations. Development work is in progress and the ore zone is said to be extensive.

Railroad From Nogales to City of Mexico Nearing Completion

The new line of the Southern Pacific of Mexico from Tepic to La Quemada will be completed in July or August, 1926, according to H. B. Titcomb, president of the road. The line will connect the west coast of Mexico, at Nogales, directly with Mexico City. It will open up a wonderful country, rich in hard woods, fish, game, and minerals. Agriculture and mining are carried on to some extent, but according to Mr. Titcomb these industries are infantile in comparison to the great territory available for farming and stock raising and for the development of the mining industry.

Mineral and Water-Power Resources of the Gold Coast

Gold, Manganese, Aluminum, and Diamonds Principal Assets.

On Sept. 30, A. E. Kitson, director of the Gold Coast (Africa) Geological Survey, delivered an address at Winchester House, London, in which he pointed out that large portions of the country are covered with rock detritus and the thick vegetation of tropical forests, which effectually mask the underlying rocks. It follows, therefore, that although the country possesses large deposits of minerals of economic value, many deposits are at present hidden from sight. So far as is known, the mineral deposits of economic value comprise gold,, manganese, and aluminum ores, and diamonds, the first-mentioned metal being widely distributed throughout the country. It occurs in lodes in the matrix near, or in, its original home, and in alluvial and beach deposits.

Of the lode gold, the most important sources are the banket and quartz reefs, from which 86,041 and 111,950 fine oz., respectively, were produced in the year ended March 31, 1924, while alluvial deposits produced 2,712 fine oz. The average yield from the banket reefs was 9.81 dwt. per ton, and from the quartz reefs 12.33 dwt. per ton, while the yield of alluvial gold was 5.05 grains per cu.yd. Mr. Kitson pointed out that a much greater total annual output could be obtained if sufficient African labor for underground work could be secured and if hammer drills were substituted for hand drills.

Manganese ore occurs in many forms, but, so far as is known, the deposits formed by surface concentration during the weathering of manganiferous phyllites, spessarite quartz, and other rocks are the only ones of economic value. Those of Insuta-Dagwin are the most important, comprising, as they do, a series of very large disconnected masses forming a prominent ridge about two miles long and rising to a height of over 350 ft. at one end. At many places are large outcrops of massive manganese ore extending downward to at least 100 ft., while nodular ore is found in great quantities on the slopes of the ridge. A large proportion of the Insuta-Dagwin ore is of high quality and is specially suitable for the manufacture of ferromanganese, while some of a better quality is used in the chemical industries. An average ore, however, contains, by analysis, 50 to 53 per cent of manganese, 2 to 4 per cent of iron, 3 to 7 per cent of silica, and 0.1 to 0.12 per cent of phosphorus. The deposits were discovered by the Geological Survey in 1914 and were not developed until 1916, from which time up till the end of 1924, 579,170 tons of ore have been exported. At present the output is at the rate of about 360,000 tons per annum.

Large deposits of bauxite have been discovered at many places, chiefly on the summits of the highest flat-topped mountains, where they form caps from 10 ft. to over 40 ft. in thickness. One of the principal deposits is on Mount Ejuanema, where it is estimated that 4,000,000 tons of bauxite are available. The average alumina content of the ore is given as 60.66 per cent, and as the mountain is only about 1½ miles from Nkawkaw railway station, which is 111 miles from Accra and 249 miles from Sekondi, via Kumasi, its commercial utilization for the production of metallic aluminium and in the manufacture of high-alumina cements would appear to be quite feasible. There are many other useful bauxite deposits in the country which, if developed, would form an important source of alumina.

Diamonds are widely distributed throughout the Gold Coast, where they occur in the gravels of streams and in old marine deposits, but, so far, they have only been proved to occur in numbers sufficient to be of economic importance in the basin of the Birim River, in Akim. Diamond mining has been carried on in the Birim Valley since 1919, the total yield, to the end of last June, amounting to 115,000 carats. Most of the diamonds are small, but, being of good quality, they are readily salable.

In the future development of the above-mentioned and other mineral resources of the Gold Coast, it is probable that water-power will play an important part, through the harnessing of such streams as the Volta, Black Volta, and White Volta Rivers.

It is evident that the known resources of the Gold Coast are of sufficient importance to warrant careful consideration from those who can assist in their development, although there can be no doubt that further investigations will materially augment the possibilities of the country. The pioneer work of the geologist, to which such information as is now available is mainly due, must greatly facilitate the subsequent operations of the prospector, to whom Mr. Kitson supplied many useful hints in the course of his address. It is to such work, followed by that of the mining engineer, that the prosperity of these mineralized areas is due.

Comstock Merger Produced $164,000 in September

DURING September the Comstock Merger Mining Co. produced 35,200 tons of ore and shipped $164,000 worth of bullion. The Middle Mines group produced 10,338 tons of ore and the Gold Hill mines 24,862 tons. Development footage totaled 2,107 ft. Important development work is being carried on in various sections of the mines, and especially in the Gold Hill group, where hanging-wall crosscuts are being driven into virgin territory.

Surface equipment has been moved from the Golden State shaft to the Overman shaft, and this shaft is to be opened and development from it resumed. A portion of these workings are in bad condition from caves due to an underground fire of several years ago which resulted in closing the mine at that time. Crosscuts will be driven around the caved areas and the ore recovered.

Canadian-Lorrain Issues Additional Stock for Working Capital

Canadian-Lorrain stock, which is controlled by the Huronian Belt Co., an English organization, has established a new high record. This company is issuing 700,000 treasury shares at a price of 50c. a share, which present shareholders can take up at the rate of 35 shares for each 100 now held. This money will be used to repay advances by the Huronian Belt Co., amounting to $125,000, and will provide funds for further development and for a mill. Recent underground work has shown extremely high-grade ore.

Kirkland Lake Opens Orebody on 2,000 Level

Reports of the Kirkland Lake Gold indicate that the new oreshoot discovered on the 2,000 level is likely to rehabilitate this company. Approximately 80 ft. of drifting has been done to date, with values running $30 to $35 across a width of five to six feet. This is believed to be the upper extension of orebodies which are raking in from the east. Two thousand feet is the lowest level established in Kirkland Lake, and the occurrence of ore at this depth is a favorable indication for other properties.

Harker Gold Mines, Ltd., Closed Pending Refinancing

It has been decided to close the Harker property, in the Lightning River gold area, Ontario. The developments to date have been encouraging but not conclusive, as a slightly higher grade of ore is necessary to make a profitable undertaking. Development has been carried to the 500 level, but it is considered necessary to sink the shaft to 1,000 ft. and do at least 3,000 ft. more lateral work on the 500 level. The estimated cost of the proposed work is $250,000, and it has been considered advisable to close the property until arrangements have been made for this financing.

Patriquin Mine Ships Quicksilver

A second shipment of quicksilver has been made to San Francisco from the Patriquin mine, near Coalingua, Calif. This shipment consisted of twelve 75-lb. flasks. The first shipment was made a few weeks ago. Production at the mine is increasing.

North Fork Mine Sold

The North Fork Mining Co.'s holdings, aggregating 323 acres of river channel and lode claims in the Forest District, Sierra County, Calif., were authorized to be sold, at a recent meeting of stockholders, to the Hercules Gold Mining Co., a Nevada incorporation. The North Fork company is to receive 217,269 shares of common stock and 15,000 shares of preferred stock of the Hercules company. The property has 7,000 ft. of shafts, and underground workings, as well as a surface plant.

London Letter

By W. A. Doman
Special Correspondent

Tin at £280 per Ton Stimulates Mining—Rhodesian Asbestos in Demand

London, Oct. 20—Tin is the most prominent metal at the moment. In every district where it is being won, great activity prevails, and, as always happens in such times, company flotations are numerous. The rise in the price of the metal to close upon £280 per ton has not only enabled the successful producers to increase their dividends, but is permitting the small, low-grade areas to be worked successfully. Tin production is active and the price advancing, despite the general depression in trade. The tin-plate industry in South Wales is looking up in no uncertain manner. The feature of the week is the formation of the Bolivian & General Tin Trust, with a capital of £500,000 in £1 shares. The point about this trust is that the Fabulosa Mines Consolidated, a Bolivian undertaking, will be brought under British capital and management. The idea which at one time prevailed, that Bolivian tin would supersede, or prove a serious competitor to, the metal won elsewhere, has been knocked on the head, as Bolivian tin smelted at Liverpool contains impurities and has to be toned up by mixing with Nigerian concentrates. The Nigerian producers claim that their concentrates should be sold at a premium in relation to the Bolivian products, but they do not make much progress with their claim.

Sir Abe Bailey's Nigerian Base Metals Corporation has arranged to acquire the tin-mining rights in northern Nigeria of the Niger company. Exactly what sum is to be paid by the Base Metals Corporation has not yet been divulged, but it is expected to run into hundreds of thousands of pounds. The Niger company has a vast area to deal with, and any future discoveries of tin will be shared with the Base Metals Corporation, which, it is said, has tin ore reserves of 30,000 tons already.

The Colombian Mining & Exploration Co. announces that the working scale tests of the new treatment for the Echendia high-grade ores have confirmed the laboratory experiments. Plant will shortly be shipped, and is expected to be running in about six months' time. Development work is to be resumed at Echendia and Candelaria mines. The Marmato position is to be discussed with the Colombian Government, and the managing director is to return to Colombia. His mission may possibly clear up what appears to be the mystery of the value placed upon the property, and the proportion accruing to the company.

According to Edmund Davis' statement at the annual meeting of shareholders of the Rhodesian and General Asbestos Corporation, there is such a demand for the company's fiber that a new milling plant had to be erected and the power plant at Shabanie also increased. The capital expenditure is being met out of the resources of the company. Mr. Davis stated that the Shabanie stands out as one of the most magnificent asbestos properties so far discovered in the world, having regard to the large proportion of high-grade fibers it yields in comparison with the tonnage produced. The corporation is unable to supply the 1926 demand by several thousand tons, and plans are being prepared to deal with what is likely to be the greatly increased output for 1927. The corporation has another property which is not yet producing, and the capital is to be increased from £630,000 to £1,000,000.

Compagnie Aramayo de Mines Increases Production of Tin

The fifth general meeting of the Compagnie Aramayo de Mines was held recently at its offices in Geneva. Reports indicate a prosperous condition in its Bolivian mines. Production records for the first half of 1925 increased by 281 tons of tin over those for the same period of 1924, bismuth by 18 tons, copper by 20 tons, and silver by 35,000 oz. Development in the mine of Chocaya in both silver and tin has been satisfactory, and total reserves in this mine have been considerably increased.

September Production of Burma Corporation, Ltd.

During the month of September, 26,448 tons of ore was mined by the Burma Corporation, Ltd., including 1,500 tons of high grade ore. The refinery products were 4,000 tons of refined lead and 408,599 oz. of refined silver. The experimental zinc plant produced 1,370 tons of zinc concentrate, assaying 15.5 oz. of silver, 8.2 per cent lead, and 45.5 per cent zinc. In addition to the above, 750 tons of copper matte was produced from the treatment of accumulated smelter byproducts and 4,651 tons of copper ore.

Copper-Nickel Ore Reported at Potsamo, Finland

It is reported that a geographical survey conducted in Potsamo, Finland, has made new discoveries of nickel and copper ore in that district, the quantity being claimed to be sufficient for profitable mining. The value in the richest deposits is considerably larger than that of the Outokumpu copper deposits, which are in the south of Finland.

Zinc Reduction Plant for Kootenay

Plans are well advanced by the Canadian Metals Extraction Co., Ltd., for the establishment of a new zinc-reduction plant in the Kootenay country, according to information received by the British Columbia Chamber of Mines. The initial unit will be capable of producing daily ten tons of electrolytic zinc. The mill will be capable of extension to one hundred tons' capacity daily.

Colombian Government Permits Exploitation of Platinum Claims

In the next few weeks the South American Gold & Platinum Co. will start to work a certain group of claims that the company acquired rights to several years ago, but which the Colombian government has heretofore refused to permit the company to operate. The earnings are now at a good rate. This new property should increase earnings materially, as prospecting has shown the ground in these claims to be richer in platinum than that being worked at present. The hydro-electric plant which was completed earlier in the year has greatly decreased the yardage cost of handling the gravel, as it is no longer necessary to haul in oil for fuel in generating the power for the dredges.

The plant is operating at about 50 per cent of capacity, so that the company has plenty of surplus power available for operating additional dredges.

Lupa River Gold Placers Yield 3,359 Oz. in Seven Months

For the seven months ended July 31, 1925, the gold received from the Lupa River diggings totaled 3,359 oz. of bullion, valued at £13,436, which is nearly double the figures of the preceding year. The method of working the alluvial gold deposits in the bed of the Lupa River is hand panning. Between 200 and 300 white prospectors are established at the camp, working individual claims, each with a 12-ft. river frontage 100 ft. in depth. The Lupa River gold district is in an almost inaccessible region in Southern Tanganyika, nearly 300 miles from the railway. The country is semi-arid, covered with bush, and infested with the tze-tze fly so generally that there is no animal transportation. Food is said to be scarce, and prices are high.

Anglo-Chilean Cons. Nitrate Corporation Plans New Process

After a series of tests covering a period of five years, a new process for extracting nitrate from caliche has been developed which increases the amount of nitrate recovered from raw material from about 60 per cent to upward of 90 per cent. The process has produced satisfactory results during tests conducted for sixteen months in a semi-commercial plant erected by Guggenheim Brothers in Chile.

Treating the crushed nitrate rock in open 40-ton vats is to be replaced by large scale operation in 7,000-ton capacity vats. By this method it will be possible to treat lower grades of caliche, and greatly reduced costs of operation are expected.

Mond Nickel Completes Sulphuric Acid Plant

The new sulphuric acid works at the smelter of the Mond Nickel Co., at Coniston, Ont., has been completed and is now in successful operation. This plant is designed on the latest and most approved principles, using the contact process, and the product is of the highest commercial quality.

Societies, Addresses, and Reports

Lead—The Precious Metal

Present High Prices Likely to Continue for Some Time in Opinion of Authorities at Mining and Metallurgical Society Meeting

By Edward Hodges Robie
Assistant Editor

NO FEARS need be entertained about the supply of lead, as high prices will bring it out; but present sources of supply cannot be expanded much and we do not know definitely about any others. That, in a sentence, was the feeling of the dozen or so producers, consumers, geologists, economists, and others who contributed to a discussion of "Lead—The Precious Metal" at the monthly meeting of the New York section of the Mining and Metallurgical Society of America, held at the Harvard Club on Oct. 29. The subject, the title of which was borrowed from that of a book by O. C. Harn, reviewed in these columns a year ago, was a popular one, about sixty attending the meeting, many of whom were well-known sellers and buyers of lead in New York.

Harris K. Masters was chairman, and introduced the principal speaker of the evening, J. R. Finlay. Mr. Finlay said that world production of lead this year promised to be about 1,600,000 tons, a 27 per cent increase over that for 1913. Assuming that the present index price for all commodities was about 160, the present price of lead should be 7c. per lb. to be equivalent to the 1913 price of 4.4c. per lb. This year's price, then, was about 25 per cent above normal; or, stated in another way, the 1913 equivalent of present prices would have been 5½c. This would not have been without precedent, for in 1906 and 1907 the price of lead averaged about 5½c. Summing the matter up, the world was using a quarter more lead and paying a quarter more for it than in 1913.

Lead So Far Chiefly from the "White" Continents

Mr. Finlay then took up the world sources of lead. If all the rest of the world's area would do as well as North America, the world would produce 5,000,000 tons of lead a year, he said, North America now producing 55 per cent of the total output. Before the World War, 95 per cent of the lead came from the highly civilized countries, as the metal was too cheap to warrant the cost of bringing it from the more remote regions. The Mexican and Australian mines, he said, were really started for silver rather than lead. On the other hand, copper and the precious metals have been produced in the most remote regions, their higher price making transportation a less serious item. Five-sixths of the world's copper came from remote places, but only half of the world's lead from what might be called new and remote areas.

Mr. Finlay argued that Asia, Africa, and South America had an area two and a half times as great as the so-called "white man's continents," but they produced only 10 per cent of the world's lead. "Does any one suppose," said Mr. Finlay, "that these continents have little or no lead?" He then quoted opinions expressed by Dr. Bain recently that North America was better mineralized than the rest of the world; that if the price of lead were fixed at the present level, the more remote countries would expand their production greatly; and that production was merely a matter of price.

Mr. Finlay then asked if there were any geological reason why the dark continents should not contain lead. Assuming that they had large lead deposits, and that they would be developed, would the price of lead then fall back to its old level? In considering this, one might well compare the history of copper; the price dropped as foreign development brought out the metal, though many years elapsed before the large foreign mines became important producers. The price of lead must remain high enough and steady enough to tempt capital to go after and develop large bodies of ore; a remote mine should be capable of producing, say, 100,000 tons a year to be attractive. Cheap foreign labor might be necessary, though in Mr. Finlay's experience, its cheapness, when judged by results, was a rainbow.

Time Required for Development

No big copper project, he said, had reached a paying stage inside of ten years, and there was no reason to suppose lead would begin to return the investment any sooner. Lead-ore outcrops are not so prominent as those of copper and it probably would be more difficult to find and develop a mine. He cited the Cœur d'Alene deposits, where the showings were not attractive, only three of the five or six good veins outcropping, and only one of these outcrops being prominent. The cost of developing a large deposit would evidently be large. All in all, the present situation was not likely to be ameliorated by new developments inside of ten years.

Then came the question as to whether the present mines could be expanded. The known sources of lead were being taxed about to their capacity now, and new deposits have not been developed nearly to the extent of those of copper, for instance. Any increase in the production of lead would seem to have to come from new sources, and present high lead prices would be likely to continue until these sources were developed, as has been done in the copper industry.

Clinton H. Crane, president of the St. Joseph Lead Co., was then called upon for a few remarks. Mr. Crane thought that enough lead would be brought out to supply any demand needed in our lifetime. Mining engineers, he said, hesitated to assume a future price for lead above 5½c. in their calculations on future work, but he was inclined to think this figure a little low. More engineers, he thought, should have confidence in the continued strength of the present situation. The St. Joseph Lead Co. had an enormous tonnage of low-grade ore, formerly not called ore at all, that could be mined at present prices. He thought it absurd to believe that the small area of the world now producing lead contained all there was.

A prominent user, E. J. Cornish, president of the National Lead Co., was asked to represent the group on the other side of the picture. His sales of white lead, he said, had fallen off 15 per cent this year compared with last, and that should be something that would help the lead scarcity from becoming worse. He cited Rockefeller's confidence, when oil wells were first found, that if Providence had provided a few, it would no doubt provide a lot more, and that this confidence in the promiscuous occurrence of oil had been the foundation of his enormous fortune. He thought the wide distribution of lead might be viewed with the same confidence. Then he brought up the question of advertising; the copper producers were pushing the uses of copper by advertising, likewise the zinc producers, especially New Jersey Zinc; but the publicity work for lead was all left to the National Lead Co. with the exception of a little help from Eagle-Picher. He pleaded for a little help from the sellers of lead in pushing the sale of that metal in its various forms.

Big Foreign Deposits Not Yet Discovered

The importance of foreign sources of supply having been emphasized, H. A. Guess was next called upon to tell where new deposits of the metal might be found. However, he said that he had not run across anything that looked very substantial. The Canadian increase had all been from one mine, the Sullivan. The Mexican production should increase in the next few years faster than in the past; there were no indications of any big mine there, but many small properties would be stimulated. Canada should also have more good lead mines. He did not think there was much that was big in South America, and asked C. V. Drew, vice-president of Cerro de Pasco, for confirmation of this thought. Mr. Drew, doubtless with his own properties in mind, had to admit that the possibilities for something important in Peru were pretty good. Mr. Guess then told of looking at a property in Brazil, but said that it did not appear to be intended for

this generation, and Mr. Cornish said transportation conditions did not encourage search in Argentina. In reply to a question, Mr. Guess remarked that a prospect in the Philippines that he had inspected did not materialize. Mr. Cornish then volunteered the information that the entire output of the National Lead Co. was 4 per cent less this year than last. In closing his remarks, Mr. Guess estimated that the United States production this year would be about 54,000 tons a month, compared with 49,000 last year.

A written discussion by W. R. Ingalls was read by P. E. Barbour. Mr. Ingalls estimated that consumption of lead for white lead this year in the United States would be 150,000 tons; for batteries, 170,000 tons; for cable covering, 138,000 tons; and for the building industry, 83,000 tons. Lead, he said, was indispensable for batteries and cable covering but not for paint. Speaking of the Australian discoveries, he thought the production of the Mount Isa field would only offset the gradual decline of Broken Hill. The scarcity of lead would have to be analyzed with regard to price.

Ludwig Vogelstein, vice-president of American Metal, thought it strange that higher lead prices had not affected the demand, and referred to the fact that it had not been possible to increase lead production as much as that of copper during the World War, thus indicating the more limited sources of supply. Many of the increases in lead consumption have been for luxury purposes, he thought, such as automobiles and radios. He did not think that the production and consumption of metals were approximately balanced, as Mr. Ingalls had stated in his discussion, and cited copper as an example, large stocks having been built up after the war. Why should not lead be as high priced as copper? Mr. Vogelstein inquired, it being demanded in approximately the same tonnage. Answering his own question, he stated that the metallurgy of lead was cheaper and that the supply of lead ores provided by nature had been more adequate. He thought that lead prices would continue high for some time, and expressed his sympathy for the National Lead Co., which he thought was in a state of "deplorable prosperity" owing to the high prices. He felt sure that production from more remote properties would be stimulated.

The advertising manager of the National Lead Co., O. C. Harn, naturally fell in with the suggestion that had been made by Mr. Cornish that more advertising of lead would be a good idea, for otherwise old customers might become users of substitutes and be hard to get back in the fold. Still, such propaganda was more or less of a boomerang, for increased consumption would tend to increase prices, which, in turn would curtail the demand.

Good Prospects in Burma

E. P. Mathewson was asked about Burma. This property, he said, had taken twenty years to get to the dividend stage, the first dividend being paid a few months ago. Labor was the chief difficulty there, the natives preferring to work only in the dry season, only about 30 per cent of them being year-round employees. The company was producing about 1,000 tons of ore a day, from rich mines that were easily worked. There were several other desirable properties in Burma, and also in China, near by. Answering Mr. Vogelstein's query about why lead prices should not be so high as copper, he said that the reason was that it cost about 4c. a pound to produce lead and 12c. to produce copper. Metallurgical improvements would increase the supply of lead, he thought, and secondary lead would come into the market in increasing amounts. In his opinion there would be plenty of lead unless the population of the world increases greatly and all Chinamen ride in automobiles.

Mr. Finlay then spent a few minutes in replying to a question raised by Mr. Cornish on the effect of the value of gold on the price of lead. He traced the effect of gold on prices, from the time of the Californian discoveries to the present. Conditions now were about as they were in 1870, he thought. Gold mining was discouraged in times of high prices, because cost of production was greater while the unit value of the product was constant. The high prices of lead would stimulate production for a long time, projects being carried on even after the price of lead had fallen.

Asked about conditions in Mexico, Dr. Otto Sussman, of the American Metal Co., said that the Ahumada and Erupcion mines were largely responsible for the big increase in Mexican production, and that the mines with oxidized ore deposits were on the decline. The development of flotation has gone far in making lead mines there profitable. The production from small mines in Mexico had increased greatly in recent months, but much of this production would drop off if the price should go down a cent or two.

George A. Easley, who had just returned from Bolivia, stated that there were only small lead mines in that country, the production being 33,000 tons in 1924 and 23,000 of this being from old silver slag dumps, most of which had now been recovered. The small mines would increase their production with present prices, however. Transportation was the big problem. There seemed to be no prospects of any large producing mines in that country.

No one present seemed qualified to say much about Canadian possibilities. Mr. Guess said that Trail was now producing 9,000 to 10,000 tons of lead a month and that he did not think any increase was contemplated, and Mr. Campbell, of Montreal, said that there were few lead mines so far developed in Canada, the deposit at Galetta, Ont., being the only producer of importance in the eastern part, this mine turning out about 6,000,000 lb. a year.

Dr. Sussman brought up the point that practically all lead mines also produce silver and asked what was the possibility of finding lead mines without silver. J. E. Spurr said that this was a difficult question to answer. He thought there was probably plenty of lead in the world, but it was not altogether reasonable to base potential production on relative areas of the earth's crust, as Mr. Finlay had suggested. Also, it did not follow that because large bodies of copper had been developed in out-of-the-way places, the same success would be had in finding important lead deposits.

Hamilton M. Brush wound up the discussion with a few remarks in his characteristic calmly logical style, pointing out that a fair price for a commodity was hard to determine. During the arsenic boom he had stated, for example, that 9c. was a fair price for white arsenic, and when the market advanced to 15c. he was besieged with demands that he sell at his publicly stated fair price. The high level brought out an enormous overproduction, which demoralized the market and brought about present conditions, with a price of 3½c. The same thing happened with zinc during the World War, the price going above 20c. a pound, and bringing out an enormous production that also demoralized the market for years, the zinc industry only now getting back on its feet. Mr. Brush thought high lead prices would bring out lead in the same way, and he emphasized the necessity of holding prices steady to keep away from the evils that had attended the wide fluctuations mentioned for arsenic and zinc.

Annual Mining Congress Convention Will Be at Washington

The American Mining Congress will hold its twenty-eighth annual convention at Washington, on Dec. 9, 10 and 11. This is the first time in the history of the organization that it has held an annual convention in the National Capital. The convention will be featured by addresses by leaders in the field of mining, by government officials having jurisdiction of affairs affecting mining, and by Senators and Representatives on mining legislation. The deliberations of the convention are expected to center around taxation, standardization of mining machinery, equipment and practice, and stabilization of the mining industry. Resolutions will be passed on various questions as expressive of the attitude of the organization on problems affecting the industry. Officers of the organization for 1926 will also be selected. Louis S. Cates, of Salt Lake, general manager of the Utah Copper Co., is president of the organization.

John P. Gray Will Address Northwest Mining Convention

The thirtieth convention of the Northwest Mining Association will open Monday, Nov. 30, in the Chamber of Commerce Building, Spokane, Wash. New officers will be installed as follows: President, Arthur L. Hooper; vice-president, M. J. Sweeny, of the Boyles Brothers diamond drilling concern; second vice-president, R. K. Neill, of the Premier mine.

On Dec. 1 the speaker of the day will be John M. Gray, mining attorney, of Coeur d'Alene, Idaho. Other features of the convention will be a banquet, a smoker, and an augmented program at the regular weekly luncheon of the association.

Men You Should Know About

E. J. Schrader has returned to Reno from an examination trip into various parts of Idaho.

George H. Garrey, who has been in San Francisco and Los Angeles, is now in Salt Lake City.

W. A. Clark, 3d, left Butte a short time ago to examine mining property in the Belgian Congo.

Melville Fuller Coolbaugh was inaugurated president of the Colorado School of Mines on Oct. 31.

W. C. Mansfield, of the U. S. Geological Survey, is engaged in field work on the Upper Miocene of Florida.

W. Fairburn has been placed in charge of operations at the Hillcrest silver mine of Gowganda, northern Ontario.

F. K. Brunton has been appointed mill superintendent to the Julieta Gold Mines Ltd., S. A., Troya, Chihuahua, Mexico.

John G. Kirchen, general manager for the Tonopah Extension Mining Co., has returned to Tonopah from San Francisco.

W. W. Fondren, of Houston, Tex., vice-president of the Humble Oil & Refining Co., has returned from a two-months' vacation in Europe.

Charles W. Clark, president of the United Verde Copper Co., is in Butte inspecting workings of the W. A. Clark estate property in that vicinity.

H. B. Simcox, of Denver, Colo., general production superintendent of the Continental Oil Co., has inspected that company's properties in north Texas.

C. S. Barns, of Monte Vista; **Thomas S. Welborn**, of Hesperus, and **C. A. Stokes**, of Mancas, all of Colorado, are at Tierra Blanca, near Lake Valley, N. M., on mining business, preparatory to reopening the famous old Log Cabin mine, which they have acquired.

Scott Turner has been appointed Director of the U. S. Bureau of Mines, for which, for a number of years, he has acted as a consulting engineer. A biographical sketch of Mr. Turner's career and achievements will appear in an early issue of *Mining Journal-Press*.

Charles Butters left New York for San Francisco on Nov. 1 and will sail from the last-named city on Dec. 3 for Nicaragua, en route to the San Albine Gold Mines, at Jicarb, Segovia, where he will complete and start the new mill now under construction.

Charles R. Miller has been elected chairman of the board of the Tonopah Mining Co., **Walter L. Haehnlen**, president, and **George W. McDougal**, a director. The changes were to fill vacancies caused by resignation of **J. H. Whiteman** as chairman of the board and a director.

Captain A. M. Yonge has just returned to Havana, Cuba, from a trip to New York, where he was called as consulting mining engineer for the Keith-Marshall interests in a lawsuit tried before the Supreme Court of New York, brought by Porto Rican mine owners against the above-mentioned interests for a very large but fictitious tonnage of commercial manganese ores claimed to have been contracted for by a representative of the Keith-Marshall interests in 1918. The amount of the claim was close to a half million dollars. The trial was complicated but interesting, and was finally settled through the efforts and recommendation of the Court, by payment of $20,000 to the mine owners.

M. H. Guise, of Seattle, recently returned from a prospecting trip which took him into the Arctic Divide Mountains, in Alaska. He traveled alone or with Indians of the Chandalar tribe, meeting no other white men. Mr. Guise courteously placed at the disposal of *Mining Journal-Press* the accompanying interesting snapshot.

M. H. Guise

Obituary

Hugh L. Guinn, representative in eastern California and western Nevada for the Ingersoll Rand Co., passed away in Reno after a short illness on Oct. 18.

Dr. Frederick B. Peck, professor of mineralogy and geology at Lafayette College, died at Easton, Pa., on Nov. 2 of heart disease. He was sixty-five years old. He was graduated from Amherst College in 1886 and had been at Lafayette since 1901. His wife and one daughter survive.

Albert E. Lowe, long engaged in metal mining in Nevada and Colorado, of which last named state he was a native, is dead. He was a son of Theodore Lowe, one of the pioneer miners of Colorado, and a brother of Henry P. Lowe, also well known to Colorado mining men.

Wilford A. Cameron, of New Denver, B. C., lessee of the Rambler-Cariboo and Mollie Gibson mines, was accidently killed recently through the overturning of an auto. Mr. Cameron was on the staff of the Consolidated Mining & Smelting Company of Canada for many years, being superintendent of the St. Eugene mine at Moyie; the Ottawa, at Slocan City; the Richmond-Eureka, at Sandon, and the Lucky Thought, at Silverton. He was forty-four years old.

Captain Warrington Pritchard, pioneer, sailor, miner, soldier, died in Fort William, Ontario, on Oct. 24. He was 100 years and 44 days old. Captain Pritchard was of English-French stock, and was born in a log hut on the banks of Otter Creek, near St. Thomas, Elgin County, Ontario. In his young manhood he came to the United States to learn the rudiments of engineering, later becoming a pilot and vessel owner. In his later years Captain Pritchard acquired an interest in several mining locations, among them the Heron Bay mine, the Pie Island silver mine, and Princess Bay mine. He is survived by four sons and two daughters.

George F. McMillan, for over forty years a resident of Grant County and Vanadium, N. M., died on Oct. 10 at the Santa Rita Hospital. Mr. McMillan was widely known as a mine owner and mine operator in southern New Mexico. For many years he had been the owner and operator of the well-known San Jose mine, near the Chino Copper Co. property at Santa Rita. Under his ownership and direction, this mine has been in almost continual and productive operation for more than thirty-five years, producing copper and lead ores. While supervising operations in this mine Mr. McMillan met the accident that caused his death. He was eighty years old, and did not long survive the shock of a comparatively short fall from a ladder. He was born in Nova Scotia, and had been in Grant County since 1882. Widely and favorably known, many, especially of that generation of miners of the booming 80's, and since, will learn of his passing with profound regret.

Thomas J. Phillips, formerly for many years with the American Smelting & Refining Co., died on Oct. 23, 1925. Mr. Phillips was prominently identified with the sales of metals from some time in the 70's of the last century. He was located in St. Louis for many years, and in the 90's, when the National Lead Co. was organized, he was called there as that company's purchasing agent of metals. From the National Lead Co. he was called to M. Guggenheim Sons as their sales manager—for a time he was located in London as their representative, returning later to New York. In 1901, when M. Guggenheim Sons amalgamated with the American Smelting & Refining Co., Mr. Phillips became sales manager of the American Smelting & Refining Co., with whom he remained until 1908, when he retired. For a few years thereafter he was special partner in a brokerage house. About 1910 he made his home in Southold, L. I., generally spending his winters in the South. Mr. Phillips was seventy-six years old at the time of his death. He was one of the best-known figures in the metal world for a great many years, being prominently connected with the largest metal-consuming and metal-selling companies in the United States.

Recent Technical Publications

Reviews, Abstracts, and References

A Technical Dictionary of French and English

Kettridge's Technical Dictionary. By J. O. Kettridge. Vol. 1, French-English; Vol. 2, English-French. George Routledge & Sons, Ltd., London; The H. W. Wilson Co., New York. Price $14.

The only way that the value of a dictionary may be determined is by use; it does not adapt itself to reading for the purpose of a review. It was the proverbial Irishman, probably, who said that he did not like to read the dictionary because he lost the thread of the story in the great mass of detail. So far, we have not used the volume mentioned above long enough to appraise its value, but so far as we have used it, it has been thoroughly satisfactory, and for technical terms it is certainly much more useful than the Spiers and Surennes which adorns our shelves.

The author has previously written a French-English and English-French dictionary of financial and business terms, so is not without experience in this line of work. The present volumes cover the terminology of civil, mechanical, electrical, and mining engineering, and allied sciences and industries, about 100,000 words, phrases, and terms being listed. No attempt is made to include words that have no technical significance, but most words have. If one wishes to know the French word for "somewhere," for example, he cannot find it here, but the word "probable" is listed in connection with the term for "probable ore"—"minerai probable."

The arrangement could hardly be improved upon. The type is sufficiently large to be legible, and bold-face type is used to good advantage, so that the appearance of the pages is excellent. The following excerpt from the author's preface is worth quoting:

"Rapid reference is rendered impossible in many works of reference by an arrangement consisting largely of paragraphic conglomerations, and by the use of signs or abbreviations, such as dashes or initial letters, to represent a recurring vocabulary word. These space-saving devices are hailed as a triumph of condensation. As a result, the reader must search through a quantity of matter that does not interest him until he may fall upon what he is looking for, and is distracted by having constantly to bear in mind what the signs or abbreviations mean. To begin every vocabulary entry, irrespective of its length, on a fresh line, and to repeat the vocabulary word in full whenever it occurs, is the only way to escape from such confusion. The effect of this arrangement is that the common factors, or like words, in the vocabulary are evenly tabulated the one under the other; hence the user is enabled without hindrance to run down the words next in succession to the common factors and to pick out instantly the term he wants."

This is a book that we feel that we shall be able to recommend to any one who has translations from or into French to make. Mr. Kettridge seems to have done an excellent job, as most Englishmen do when they set out on a task. E. H. ROBIE.

Russian Gold—The "Gold Industry of the U. S. S. R." is the title of a short article in the *Russian Review* of Oct. 1 (Russian Information Bureau, 2,819 Connecticut Ave., N.W., Washington, D. C.; price 15c.), giving a résumé of present conditions in the various gold fields of the Soviet union.

Tempering Drill Bits — *Reports of Investigations*, U. S. Bureau of Mines, Serial No. 2,712 (17 pages, obtainable on request from the Bureau at Washington, D. C.) is entitled "Temperature Control System for Dressing and Tempering Fishtail Bits." It is by Charles H. Shapiro. The bulletin discusses methods of heat-treating drill steel by the use of molten salt, and also by the use of a bath of molten lead covered with molten salt. Though intended primarily as a study of oil-drilling bits, much valuable information is given that applies equally well to the treatment of steel at metal mines. A proper method of heating and quenching fishtail bits will increase the footage obtained per bit by more than 50 per cent and decrease the drilling time per foot by a third of that obtained when bits are treated in an open fire without temperature control and quenched under variable conditions, according to the report.

Top Slicing — A 7-page paper by R. J. Mechin has recently been issued by the American Institute of Mining and Metallurgical Engineers, 29 West 39th St., New York City, entitled "Top Slicing in Old Fills at El Bordo Mine, Mexico." A system of mining was sought that would eliminate the difficulties inherent to the square-set system in heavy ground and that at the same time would effect the desired economies in mining. After several years, top slicing has met all the conditions most satisfactorily.

Manitoba Mining—The October issue of the *Bulletin* of the Canadian Institute of Mining and Metallurgy (603 Drummond Building, Montreal; price $1) contains a 10-page paper by J. S. De Lury entitled "An Application of the Theory of Metallogenesis to the Prospecting Areas of Manitoba," and an 11-page paper on "Recent Mining Developments in the Central Manitoba Mining District," by H. A. Wentworth.

Petroleum Drilling—"Paleozoic Formations Penetrated by Wells in Tishomingo County, Northeastern Mississippi," are discussed in a 12-page bulletin by M. N. Bramlette, issued as U. S. Geological Survey Bulletin 781-A, obtainable on request.

Mine Scrapers — "Scraping at the Park Utah Mine" is described in a short article in the October issue of *Mining and Metallurgy* (29 West 39th St., New York City; price 50c.) by C. C. Cushwa. Labor costs of stoping have been reduced from 30 to 40 per cent at this mine by the use of double-drum hoists and scrapers.

Zinc Metallurgy—Gilbert Rigg has a 12-page paper in the October issue of the *Bulletin* of the Institution of Mining and Metallurgy, on "Possible Improvements in Metallurgical Practice relating particularly to the Zinc Industry." Mr. Rigg thinks that zinc smelting is due for some marked reforms which will enable it better to compete with electrolytic processes, and he indicates the direction that some of these reforms are likely to take. His paper may be obtained for 1s. from the Offices of the Institution, Cleveland House, 225 City Road, London, E. C. 1.

Mineral Resources — The following separate chapters of "Mineral Resources of the United States, 1924," have been issued by the U. S. Bureau of Mines: "Graphite," 5 pages, by Jefferson Middleton; "Feldspar," 7 pages, by the same author; and "Platinum and Allied Metals," 13 pages, by James M. Hill. Each of these may be obtained for 5c. from the Superintendent of Documents, Washington, D. C. The bound volume for 1922, Part 2, on non-metals, is also now available from the U. S. Geological Survey, Washington, D. C.

Steel Wire—"The Effect of Wear on the Magnetic Properties and Tensile Strength of Steel Wire" is discussed in Scientific Paper No. 510 of the U. S. Bureau of Standards. The wire used in the tests was of the type ordinarily used in the construction of hoisting rope. Copies are obtainable for 5c. each from the Superintendent of Documents, Washington, D. C.

Crushing—Ball mills for fine grinding are customarily operated in closed circuit with classifiers of the drag type. Edward W. Davis and his associates at the Minnesota School of Mines Experiment Station have just published a report of tests on "Ball Mill Crushing in Closed Circuit with Screens." Three types of mills were used in the tests, the conical overflow type, the cylindrical overflow type, and the cylindrical low-pulp-level mill. The use of screens is recommended where separations of coarser material are required, such as that between 14 and 65 mesh, this material being too coarse to be adaptable to drag classification. Increased grinding capacity and lower operating costs are shown to be possible by closing the circuit with screens, the development of the vibrating type of screen having resulted in the availability of dependable equipment for either wet or dry grinding circuits. Copies of the bulletin may be obtained by writing to the Minnesota School of Mines Experiment Station, Minneapolis, Minn., and asking for Bulletin No. 10.

Alberta—The fifth annual report of the Scientific and Industrial Research Council of Alberta is now available from the Honorary Secretary, Industrial Research Department, University of Alberta, Edmonton, Alberta. Most of the work described has to do with fuels and bituminous sands.

New Machinery and Inventions

Panama to Have Largest Diesels

Record Hitherto Held by Phelps Dodge Installations Now Broken by Three New Engines Intended as Stand-bys for Miraflores Station

THE four 2,200-hp. Diesel engines which the Nordberg Manufacturing Co., of Milwaukee, Wis., built for the Phelps Dodge Corporation about five years ago have held the record in the United States for size until the construction, recently completed, by the same company of three units for Panama with a combined capacity of over 12,000 hp., which are intended to render stand-by service at Miraflores to the hydro-electric plant, 36 miles away, which normally supplies power for the Canal's operation. Phelps Dodge also has the two largest installations in North America, one of 9,400 hp. at its Moctezuma Copper Co. Branch at Nacozari, Sonora, Mexico, and another of 6,900 hp. at Bisbee, Ariz. As the record stands, the largest installations in the United States are still in the mining industry.

The two plants, at Nacozari and at Bisbee, are now exceeded by the Panama plant. In making a selection of engines for the Canal, the choice of the Panama Canal Commission is said to have been largely governed by the past performance of these large units. While the other large engines built by the Nordberg company were of the open-frame type and those for the Canal of the closed-frame type, the Panama engines are very similar in other respects, the cylinders being but one inch larger in bore.

These three new six-cylinder engines, operating at 125 r.p.m., are very conservatively rated. Their normal capacity is 3,750 hp., but they must carry an over-load of 10 per cent, or 4,125 hp. Each is direct connected to a 3,125 kva. generator of the flywheel type, this being the first instance where this type of generator has been used in connection with large Diesel engines in this country.

Like all Nordberg Diesels, these engines operate on the two-cycle principle and are of the single-acting type. Valve-in-head scavenging is used, there being four scavenging valves in each head which are opened simultaneously. The scavenging air is supplied by two reciprocating scavenging pumps with V-type cylinders and driven from a single crank on the crank shaft.

The engines must operate on the fuel ordinarily carried in large supply at the Canal and is known as "Bunker C." This is an exceedingly low-grade oil and may at times have a high sulphur content. It is generally known that sulphur in the exhaust gases has a deteriorating effect upon exhaust valves and seats, but these Diesels, being of the two-cycle type and without exhaust valves, no difficulty can be experienced from a high sulphur oil. A number of the larger Nordberg engines from the time of installation are said to have operated successfully on none other than the lowest grade Mexican fuel oils and which at times contained as much as 4 per cent sulphur.

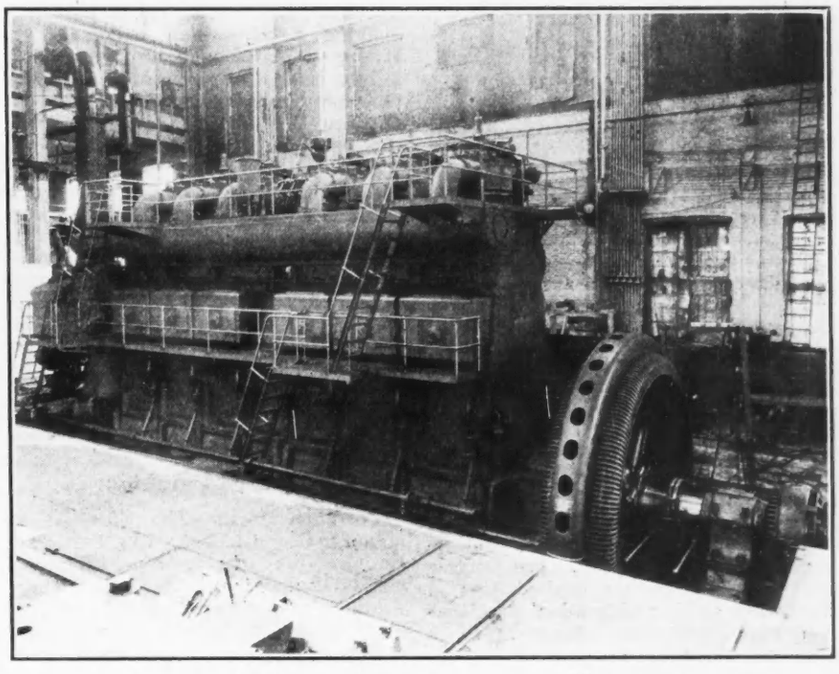
Before shipment each engine is given an acceptance test which requires a twenty-hour non-stop run ending with five hours at full load and one hour with 10 per cent overload. In order to test these mammoth units, extensive preparations were made, which in many respects approximate the actual installation. Test loads on the engine are applied by loading the generator and facilities provided for measuring this load, together with fuel and water, temperatures, pressures, and other operating factors. These tests have been made under the supervision of government engineers, and are very rigid and exhaustive.

Facts About the Panama Diesels

Rated horsepower	3,750
Indicated horsepower	5,137
Power developed on test	4,125
Number of cylinders	6
Generator	3,125 kva.
Bore	29 in.
Stroke	44 in.
R.P.M.	125
Weight of engine	815,000 lb.
Weight of engine and generator	1,000,000 lb.
Height from floor line	22½ ft.
Width	21 ft.
Length	62 ft.

When the construction work was started at the Canal, a steam turbine plant was built to supply power, but after the Canal was in operation and hydro-electric power available the hydro-electric plant was used for the main power units and the steam plant as a stand-by. This turbine plant is now getting old and has reached a point where the repairs and maintenance are high. Furthermore, it is only required for a short period when low water prevails. It means, however, that steam must be kept up at all times, which results in a considerable fuel expense throughout the entire year. The new Diesel engines, however, can be shut down until needed and then started quickly if a case of emergency arises.

It is expected that the Diesel engines will show a considerable saving in fuel. It is estimated that they will not be in service more than 1,000 hours each year. In addition to saving fuel, there will also be a saving in labor expense, as the stand-by expense of the Diesel engine practically ceases when the engines are idle.



One of the new 3,750-hp. Diesel engines set up in the Nordberg shops at Milwaukee, Wis., for its test runs

Oxygen-Making Apparatus Said to Infringe

The Air Reduction Sales Co. has notified industrial and railway users of the oxy-acetylene processes, in regard to oxygen made by a process utilizing the apparatus of the Messer and Heylandt types manufactured in Germany, informing them of a suit pending in the U. S. District Court of the District of Delaware against a user of essentially similar apparatus by reason of infringement of two patents owned by the Air Reduction Co., namely: U. S. Letters Patent No. 957,170 for separation of gases from their mixture, and U. S. Letters Patent No. 959,563 for methods for the separation of gases, etc. These patents cover important inventions in the art of the separation of atmospheric air into its constituents which are used in the operation of the Messer and Heylandt columns.

All users of the more modern Messer and Heylandt apparatus in this

country have been notified of the suit mentioned in the foregoing and of intention to enforce rights under these patents.

The Air Reduction Co. also calls attention to Messer and Heylandt apparatus of the so-called single rectification type (an older apparatus than that mentioned above) for the separation of atmospheric air into its constituents, which is also claimed to infringe U. S. Letters Patent No. 967,105. Although this latter type of German-made apparatus represents an invention that has lost much of its value so far as economical production of high-purity oxygen is concerned, and is conceded unable to meet present-day requirements for 99.5 per cent oxygen, being practically obsolete, it is the intention of the Air Reduction Company to enforce its rights under this patent also.

A Large-Size Fuse Puller Introduced

The addition of a new large-size fuse puller and replacer to its present model, a pocket-size tool, has been announced by the Trico Fuse Manufacturing Co., Milwaukee, Wis. The new tool is 12 in. long and made with seven laminations of the finest genuine gray horn fibre, securely riveted at all points subject to strain. Inserts placed between the laminations give a firm, even grip on the fuse and prevent any tendency to twist or slip in the hands of the user. It is known as the "giant size" fuse puller and is designed for use on fuses from 100 to 600 amp. 250 volts, and 60 to 400 amp. 600 volts.

Yuba Dredges Shipped to Russian Platinum Field

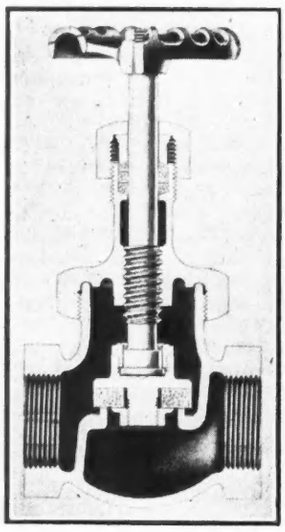
Seventeen carloads of dredging equipment, destined for the platinum mines in the Ural Mountains on the Russo-Siberian frontier, have left the plant of the Yuba Manufacturing Co., Marysville, Calif., consigned to Soviet government agents, according to the *Wall Street Journal*. Four more consignments of nearly the same size are to follow. The company is executing a $2,000,000 contract, operating day and night, and will not complete the work before March. The shipments are going Southern Pacific to Galveston and thence by water to New York for transshipment.

Hoist Improved by Addition of Gear Drive

An inclosed gear drive has been added to the electric and gasoline powered hoists rated above 30 hp. made by Street Bros. Machine Works, Chattanooga, Tenn. Steel-cut gears, running in an oil bath and totally inclosed in an oil-tight case, are used, giving noiselessness and higher efficiency. The electric hoists have a positive control, and in lifting a smooth and gradual acceleration may easily be obtained, it is claimed. They have an extended control lever that is within easy reach of the operator.

Renewable Disk Features Line of Medium-Pressure Valves

A line of medium-pressure bronze globe and angle valves for 225-lb. working steam pressure has been announced by Jenkins Bros., New York. These valves have a renewable disk feature which will satisfactorily meet higher pressures than recommended for standard pattern valves. An important feature of these valves is the



Renewable disk feature of these valves enables them to withstand higher pressure

bonnet and union, made in one piece to screw onto the outside of the body threads. This construction gives added strength to the body end, the bonnet hexagons being made especially large, allowing easy removal of the bonnet without distortion. Another feature is the "ball joint" formed when the bonnet and body are screwed together. This is a new feature, designed by Jenkins Bros., which makes a very strong, though easily removable, joint.

The valves are regularly fitted with the company's special No. 800 composition disk for high-pressure work, this being superior to a metal-to-metal seat. No regrinding is necessary to insure tightness. The spindle is made of manganese bronze, with large, powerful threads, which are all in contact when the valve is closed. The stuffing box is deep, with plenty of asbestos packing which is compressed by means of a bronze follower. A ventilated hand wheel of malleable iron is used. The valves are furnished, globe and angle with screwed or flanged ends, in sizes of ¼ in. to 3 in.

Trade Catalogs

Portable Hoists—The Sullivan Machinery Co., Chicago, Ill., has issued Bulletin 76 F. of sixteen pages, describing its Turbinair portable hoists, single-drum, class HA3, and double drum, class HDA2.

Roller Bearings—Hyatt Roller Bearing Co., Newark, N. J., is disturbing a new bulletin, No. 1559. Its purpose is to tell how to select the correct bearing for any given installation in industrial equipment.

Filter — The Laughlin centrifugal filter is described briefly in a pamphlet distributed by the Laughlin Filter Corporation, 120 Broadway, New York, at the Tenth Chemical Industries Exposition held last month. This filter will be described in detail in an early issue of the *Mining Journal-Press*.

Story of Link-Belt Development Told on Fiftieth Anniversary

Fifty years have passed since the incorporation of the Ewart Manufacturing Co., the forerunner of the present Link-Belt Co., in 1875. In commemoration of the fiftieth anniversay, the Link-Belt Co. has published an attractive book entitled "Link-Belt 1875-1925."

In this book the statement is made that the patent of William Dana Ewart, a young implement dealer, from Belle Plaine, Iowa, for the detachable link chain, was dated Sept. 1, 1874. Mr. Ewart first started to build a self-binding harvester, but he realized the great need in such a machine for a detachable chain drive that could be repaired in the field; and he worked out the idea of a chain drive, the links of which could easily be replaced by the farmer.

Late in 1874, when Mr. Ewart came to Chicago with a view to arousing some interest in his "detachable link chain," he succeeded in interesting John C. Coonley, a lawyer who was then president of the Chicago Malleable Iron Co. As a result a company was duly incorporated in 1875, under the name of the Ewart Manufacturing Co., for manufacturing detachable link chains."

New uses for the invention developed rapidly, and in 1880 the Link-Belt Machinery Co. was incorporated "to design, build, and supply accessory parts, and install elevating and conveying machinery employing Ewart chains." The plant for this company was built in Chicago.

In 1888 the Link-Belt Engineering Co. was formed with a plant in Philadelphia. These two plants found increasing numbers of new uses for the chain, with the result that all three plants continued to grow in size, until in 1906 a consolidation of the three interests took place, and Charles Piez was elected president. Mr. Piez is now chairman of the board and Alfred Kauffmann, formerly vice-president in charge of the two Link-Belt plants in Indianapolis, is now president.

The company operates and owns ten large manufacturing plants, with seven shops and warehouses, and twenty-seven branch offices, and its products include elevating and conveying equipment for all kinds of materials; complete equipment for the handling and cleaning of coal, on the ground and in the boiler house; complete coal tipples and coal-washing plants; sand and gravel washing and preparing plants; sand preparing and conveying machinery for the modern foundry, locomotive and crawler type cranes, and silent chain drives.

The Market Report

Copper, Lead, and Zinc Advance Further

Buying Continues in Good Volume in Non-Ferrous Metal Market—Tin and Silver Prices Decline Slightly

New York, Nov. 4, 1925 — The strength in the non-ferrous metal market continues, and the prices of copper, zinc, and lead all reached new high levels for the movement, in the week ending today. Zinc is perhaps the strongest of the three, climbing close to 9c., St. Louis, for prompt shipment, an advance of about 1c. for the month of October. Lead again resumes its upward trend after being held around 9½c., New York, for two and a half months; a somewhat similar advance was made a year ago, but the price then was about 1c. per lb. less than it is now. Copper again nears 15c., delivered, being at about the level that it was in the middle of September. Tin has suffered a slight setback after its recent rapid advance in London, and silver has dropped slightly below 70c.

Daily Prices of Metals

Oct. Nov.	Copper N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N.Y.	St. L.	St. L.
29	14 40	62 25	63.875	9.55	9.25@9.50	8.45@8.60
30	14.45	62.50	64.00	9.60	9.25@9.60	8.50@8.65
31	14 50	62 375	63.875	9.60	9.25@9.60	8.50@8.65
2	14.55	62.00	63.50	9.75	9.50@9.80	8.70
3	Holiday	.....	.....	.....	.....	.....
4	14 625	61.25	62.75	9.775	9.50@9.80	8.85
Av.	14.505	62.075	63.600	9.655	9.505	8.645

*The prices correspond to the following quotations for copper delivered: Oct. 29th, 14.65c.; 30th, 14.70c.; 31st, 14.75c.; Nov. 2nd, 14.80c.; 3rd, Holiday; 4th, 14.875c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of *Mining Journal-Press* and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

London

Oct. Nov.	Copper			Tin		Lead		Zinc	
	Standard		Electro-lytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
29	62	62 7/8	67 3/4	285 1/8	284 1/8	38 5/8	37 1/4	39 7/8	38 13/16
30	62 1/4	63	67 3/4	286 1/8	284 5/8	38 11/16	37 3/8	40	38 7/8
2	62 3/8	63 3/8	68 1/2	285 3/8	283 3/8	38 5/16	37	39 13/16	39 1/16
3	62 1/4	63 1/4	69	281 7/8	280 7/8	37 7/8	37	39 13/16	39 1/16
4	62 1/4	63 1/4	69	280	279 3/4	37 3/8	36 3/4	39 13/16	39 1/8

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Oct.	Sterling Exchange "Checks"	Silver		Gold London	Nov.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
29	4.84 1/4	71	32 15/16	84s10½d	2	4 84 1/8	69 3/4	32 3/8	84s11½d
30	4.84 1/8	70 3/4	32 13/16	84s10½d	3	Holiday	...	32 3/4	84s11½d
31	4.84 1/8	70 1/4	32 5/8	...	4	4.84 1/4	69 5/8	32 5/16	84s11½d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command three-eighths cent premium.

Average Metal Prices for October, 1925

Copper:	
New York Electrolytic	14.300
London Standard Spot	61.977
London Electrolytic Spot	67.523
Lead:	
New York	9.513
St. Louis	9.299
London Spot	39.017
London Forward	36.889
Silver:	
New York	71.106
London	32.972
Sterling Exchange	483.909
Zinc:	
St. Louis	8.282
London Spot	39.884
London Forward	38.656
Tin:	
99 per cent	60.462
Straits	62.274
London	277.722
Quicksilver	83.856
Antimony	18.029
Platinum:	
Refined	120.000
Crude	113.918
Aluminum, 98 per cent	27.308

Copper Strongly Held

During the week ending today, copper has advanced from 14⅝c., delivered, to 14⅞c., not a sensational change, but a steady one, and it would seem that the much-desired 15c. level is in a fair way to be attained. Sales have been about on a level with those of last week, the gradually advancing prices evidently having a good effect on bringing out business, though buyers are not inclined to place orders much ahead of January. Most of the copper sold has been for either December or January shipment, with a fair sprinkling of November. Two or three producers are somewhat more anxious to sell near-by copper than forward, but they have not a great deal on hand. Monday was the best day of the week so far as tonnage booked goes. Practically all of the sales that day were made on a basis of 14¾c., delivered to near-by points and Connecticut, and 14⅝c. to less favorably situated plants. At the close of business Monday, most sellers had come to the 14⅞c. level for Eastern deliveries, and that price was being generally quoted today, with business reported on a good tonnage for Valley delivery. Some copper was offered at slight concessions, however, especially for early shipment to near-by points, for which 14.80c. might have been done. On the other hand, 15c. was quoted for Middle Western points.

Wire and brass mills continue to be heavy buyers, and their excellent business seems to show no signs of a let-up. The American Brass Co., in October, shipped 64,000,000 lb. of its products,

which is both a peace- and war-time record. Its sales continue excellent. Other companies in the same line of business are sharing in this prosperity. However, the margin of profit is reported to be not quite so good as it used to be; in other words, though a company may be busier than formerly, it is not necessarily making any more money.

Foreign copper sales have been satisfactory all week, and sellers have advanced from their 14.85c., c.i.f., quotation of a week ago, to 14.90@14.95c. England, France and Germany have all been in the market.

Lead Advanced to 9¾c.

After maintaining its official contract price for New York lead at 9.50c. since Aug. 26, the American Smelting & Refining Co. advanced to 9.75c. on Monday, Nov. 2. The smaller producers had been getting premiums over the fixed prices of the A. S. & R. and the St. Joseph Lead Co. for several days, the last-named company having sold large quantities at 9¼c., St. Louis, over a long period. Supplies were inadequate, however, to take care of all comers, and when contracts had to be limited, the outside market naturally stiffened. Neither of these large producers is sold out of lead, even for November, but both are forced to limit outgo until they know exactly what production is to be. Lead is being sold every day at 9½c., St. Louis, and 9¾c., New York, but even some large consumers are being forced to pay more than these prices in some instances, particularly in the Middle West. Spot and prompt lead is hardly obtainable under 10c. in either the St. Louis or New York market today, and November and December shipment has brought 9.80c. in St. Louis and 9.85c., Chicago, in the last two or three days. Sales at these levels, however, are few and far between.

At the present levels, it would pay to import Mexican lead ore into the United States for smelting, as the London forward price is equivalent to about 7.96c., which, adding the 1½c. duty, would be equal to 9.46c. It is not feasible for much of such lead to come into this country, however, Ahumada and Erupcion being the principal sources.

Spot Zinc Continues Scarce

The zinc market is practically unchanged from last week, the high premiums on spot and near-by metal continuing, and also high premiums being asked for Brass Special and High-grade. Most of the metal has been sold within the limits quoted in the table, though these limits have been exceeded in some instances, as on last Friday, when spot zinc sold as high as 8.70c. and January as low as 8.45c., an unusual range, but well indicating the present condition of the market. A good tonnage has been sold during the week, mostly for December shipment, though there seems to be a good demand for November still. Consumers' stocks are reported low, only one or two galvanizers having had the good fortune to provide for their requirements very far ahead. Producers' stocks are also being reduced, so an exceedingly strong situation has been gradually built up, even without any foreign demand. According to reports, Europe will need more zinc from this side before long, but prices will have to rise considerably abroad before it will pay to sell in the export market. Brass Special continues to be quoted from 10 to 25 points above Prime Western, and high-grade has advanced to 10½c. per lb. delivered in the East. New York prices are at the customary freight differential of 35c. per 100 lb. above St. Louis.

Tin Quiet Around 63c.

But little interest has been exhibited in tin this week, and the price has declined to below 63c. today. Near-by supplies of 99 per cent grade are becoming increasingly scarce, and the 1½c. differential seems likely to be reduced. Forward Straits tin has sold about ¼c. less than spot.

China Forces Silver Down

Continued sales by China have forced silver prices steadily downward during the last week. There was a sharp advance in London on Nov. 3, but this was undoubtedly due to American offerings being curtailed on account of the Election Day holiday, as rates slumped again when the local markets reopened. The purchase of 500,000 oz. by the U. S. Government on Oct. 30 brings the total up to 2,350,000 oz. since Sept. 1.

Mexican Dollars—Oct. 29th, 54½c.; 30th, 54¼c.; 31st, 54c.; Nov. 2d, 53⅝c.; 3d, holiday; 4th, 53½c.

Foreign Exchange Steady

Changes in the foreign exchange market have been small. Closing cable quotations on Monday, Nov. 2, were as follows: francs, 4.1875c.; lire 3.965c.; and marks, 23.8125c. Canadian dollars, ⅛ per cent premium.

Zinc Blende and Lead Ore Unchanged

Joplin, Mo., Oct. 31, 1925

Zinc Blende	Per Ton
High	$61.80
Premium, basis 60 per cent zinc	$59.00@$60.00
Prime Western, 60 per cent zinc	$58.00
Fines and slimes, 60 per cent zinc	$55.00@$51.00
Average settling price, all zinc	$55.50
Galena	
High	$125.94
Basis 80 per cent lead	$120.00
Average settling price, all	$120.70

Shipments for the week: Blende, 20,121; galena, 1,962 tons. Value, all ores the week, $1,353,570.

Shipments for ten months: Blende, 678,165; calamine, 579; galena, 103,785 tons. Value, all ores the ten months, $47,368,140.

Sellers generally accepted the offerings for blende this week and purchases totaled 14,790 tons. The output, however, reached the maximum this week of 16,960 tons. The shipment was 4,000 tons less than the purchase last week, leaving more than 20,000 tons in the bins contracted for shipment.

Platteville, Wis., Oct. 31, 1925

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$60.50
Lead Ore	
Lead, basis 80 per cent lead	$125.00

Shipments for the week: Blende, 831 tons; lead, 60 tons. Shipments for the year: Blende, 39,470; lead, 1,951 tons. Shipments for the week to separating plants, 1,585 tons blende.

Iron Trade Steady

Pittsburgh, Nov. 3, 1925

Galvanized sheets have advanced $4 a ton to 4.50c., chiefly a reflection of the advance in zinc, while blue annealed sheets are up $2 a ton to 2.40c., and black sheets are firmer, ranging from 3.15c. to 3.25c. Recently automobile sheets advanced $3 a ton to 4.40c. Shapes and plates are slightly firmer. Cold finished bars are up $2 a ton to 2.50c. and hot rolled strips $3 a ton to 3.90c.

Pig Iron—Lower prices in the range of a week ago have disappeared, making the minimum up $1, the market now being $20.50 for bessemer, $19.50 for basic, and $20 for foundry, f.o.b. Valley furnaces.

Connellsville Coke—With a lull in Eastern buying, furnace coke is off 50c. to $1, being now $8@$8.50. Spot foundry coke, with revived demand, has made a market for itself, at $9@$10.

Other Metals

Quotations cover large wholesale lots, f.o.b. New York, unless otherwise specified.

Aluminum—99 per cent, 29c. per lb.; 98 per cent, 28c. London, 98 per cent, £118 long ton. Domestic market firm, with good demand. Slow in Great Britain.

Antimony—Per lb.: Chinese brands, spot, 19½@20½c.; December, 18@18¾c. Cookson's "C" grade, spot, 21c.

Chinese needle, lump, 15@16c. Standard powdered needle, 200 mesh, 19½@20c. White oxide, Chinese, 99 per cent Sb_2O_3, 19@20c.

Chinese prices continue to advance. Supply is fairly good and this year's shipments will be more than last year's, but demand is much greater, chiefly owing to increased outlet in storage batteries.

Bismuth—$2.65@$2.70 per lb. in ton lots. London, 10s.

Cadmium—60c. per lb. London, 1s. 9d. for Australian metal.

Cobalt—Shot, 96@98 per cent, $2.50 per lb. Black oxide, 70 per cent, $2.20; gray oxide, 75 per cent, $2.35. London, 10s. for metal; 8s. for black oxide; 8s. 10d. for gray. Market good.

[1]Germanium Oxide—25 to 50 gm. lots, $6 per gm.

Iridium—$390@$400 per oz. for 98@99 per cent. Nominal. London, £80@£85 for 99.5 per cent.

[1]Lithium—95@96 per cent grade in 1 to 5 lb. lots, $65 per lb.

Magnesium—Ingot, 99.85 per cent, $1 per lb. in 1,000-lb. lots. Market steady.

London, 3s. 9d.@4s. 3d. for 99 per cent ingots or sticks.

[1]Molybdenum—99 per cent, $25 per kg. C. P. metal, $80 per kg.

Monel Metal—Base price for shot, 32c. per lb.

Nickel—Ingot, 34c.; shot, 35c.; electrolytic, 38c. (99.75 per cent grade). Market fair. London, £170@£175 per long ton.

Osmium—$110@$115 per oz.; London, £22@£24.

Palladium—$78@$82 per oz. Crude, $60@$65 per oz. London, £17, nominal.

Platinum — Refined, $120 per oz. officially quoted. Sales also at $115@$118. Crude, $113.50@$114.50.

London, £24½ per oz. for refined, and £22@£22½ for crude.

Quicksilver — Per 75-lb. flask, $86. San Francisco wires $85.17. London, £14.

Radium—$70 per mg. radium content.

Rhodium—$80@$95 per oz.; London, £18@£22.

Ruthenium—$90@$105 per oz.; London, £15@£18.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2.15 per lb. in ton lots.

[1]**Tantalum**—Metal sheets, $275 per lb.

Tellurium—$2 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $6 per lb. in 25-lb. lots.

Tungsten Metal— $85 per kg. for C.P. metal.

[1]**Zirconium Metal**—98 per cent grade, per lb., $30, in 5 to 10 lb. lots.

Metallic Ores

Chrome Ore—Crude, 45 to 50 per cent Cr_2O_3, $20.50@$23.50 per net ton, f.o.b. shipping point. Demand good. Ground, in bags, $29.

New Caledonian, 52-54 per cent Cr_2O_3, $24; nominal.

Situation unchanged.

[1]**Galena Radio Crystals**—Best quality (50 per cent of sized fragments good) 50c. per lb. in 500-lb. lots, f.o.b. Philadelphia.

Iron Ore—Lake Superior ores, per long ton, lower Lake ports:

Mesabi, non-bessemer, 51½ per cent iron, $4.25. Old Range, $4.40.

Mesabi, bessemer, 55 per cent iron, $4.40. Old Range bessemer, 51½ per cent, $4.55.

High-phosphorus foundry, over 0.18 per cent P, $4.15.

Shipping season expected to close Nov. 15 to 20. Stocks greatly reduced and higher prices next year expected by some.

Eastern ores, cents per unit delivered at furnaces: Foundry and basic, 53 to 63 per cent, 9@10c.

Foreign ores, f.o.b. cars Atlantic ports, cents per unit:

Swedish and Norwegian, low-phosphorus, 68 per cent, 11@11½c.

Spanish and Algerian, low-phosphorus, 52@54 per cent, 9@10c.

Spanish foundry or basic, 50@54 per cent, 8½@9c.

Swedish foundry or basic, 66@68 per cent, 9@10c.

Manganese Ore—Per long ton unit of Mn, c.i.f. North Atlantic ports: Brazilian, 42@44c., nominal; Indian, 44c., nominal; Caucasian (unwashed), 42c.; Caucasian (washed), 44c.; Market recently very dull.

Chemical grades[1], powdered, coarse or fine, 82@87 per cent MnO_2, Brazilian and Cuban, $70@$80 per ton in carloads.

Molybdenum Ore—65@70c. per lb. of MoS_2 for 85 per cent MoS_2 concentrates, f.o.b. mines. Market firm.

[1]**Pyrite Radio Crystals**—50c.@$1 per lb.

Tantalum Ore—Foreign, 75c. per lb. of Ta_2O_5 contained, c.i.f. New York.

Tungsten Ore—Per unit of WO_3, N.Y.: Wolframite, ordinary, $11.50@$12; high-grade, $12.25@$12.50.

Scheelite, ordinary, $12.50@$13; high-grade, $13.25.

Prices firm; market remains quiet.

Vanadium Ore—Minimum 18 per cent V_2O_5, $1@$1.25 per lb. V_2O_5. Nominal.

Non-Metallic Minerals

Prices received for non-metallic minerals vary widely and depend upon the physical and chemical characteristics of the commodity. Hence the following quotations can only serve as a general guide to the prices obtained by producers and dealers in different parts of the United States for their own product. In the last analysis the value of a particular non-metallic mineral can only be ascertained by direct negotiation between buyer and seller.

[1]**Amblygonite**—8@9 per cent lithium oxide, $50@$60 per ton, f.o.b. mines.

Andalusite—Sorted, $45@$50 per ton, f.o.b. *South Dakota* mines. Sales mostly for experimental lots.

Asbestos: F.o.b. *Quebec* mines, tax and bags included, per ton:

Crude No. 1, $450; crude No. 2, $275; spinning fibers, $175; magnesia and compressed sheet fibers, $125; shingle stock, $60; paper stock, $40; cement stock, $25; short fibers, $12.

The market is good and prices are rising. Merger likely to be consummated in a few days.

No. 1 Rhodesian crude, $310; No. 2, $250 per ton, c.i.f. New York.

Barytes—F.o.b. mines, per ton, bags extra:

South Carolina: Crude, $7@$8 per gross ton; ground, off color, $14@$17 per short ton.

North Carolina: White bleached, $22 per short ton; white natural, $20.

Georgia: Crude barytes ore, $8. Very good demand for balance of year but poor up to Oct. 1.

Missouri: Water ground and floated, bleached, $23@$24, f.o.b. works.

Canada: 94@96 per cent $BaSO_4$, $9 per net ton, f.o.b. mine.

Demand steady for spot and good shipments against contracts.

Bauxite — American, f.o.b. shipping point per gross ton: Crushed and dried, $5.50@$8.50; pulverized and dried, $14; calcined, crushed, $19@$20.

Foreign, per metric ton, c.i.f.: Dalmatian, low SiO_2. $5@$6.50; Istrian, $5.50@$6.50.

Dutch Guiana bauxite offered at $8.50 per long ton, c.i.f. *New York.*

Borax—Carload lots, in bags, per lb.: crystals, 5c.; granulated or powdered, 4¾c.; f.o.b. Pa. or Ill. Market normal.

[1]**Celestite**—90 per cent $SrSO_4$, finely powdered, $30 per ton in carload lots.

Chalk—Precipitated, f.o.b. *New York*, per lb.: heavy, 3½@4c.; light, 3¾@4½c.; extra light, 4@4½c.

[1]Price furnished by Foote Mineral Co., Philadelphia.

Crude, in bulk, $4.75@$5 per ton.

China Clay (Kaolin)—F.o.b. *Virginia* mines, per ton: crude, lump, No. 1, $7; crude No. 2, $5.50; washed, $8; powdered and air-floated, $10@$20; ground, $7@$10.

Imported English, f.o.b. American ports: Lump, $11.50@$19; powdered, $45@$50.

Active demand and large tonnages being moved.

1A grades, domestic, $16@$18, f.o.b. *Delaware* plants. Market improved.

Diatomaceous Earth—Per short ton, f.o.b. plant, *California:*

Kiln-fired brick, $65; kiln-fired aggregate, ¼ in., $45; insulating powder, $30; natural aggregate, ¼ in., $20; air-floated powder, $40; "Calatom" (mill run), $20; "Calatom," 3b, $30.

Emery — F.o.b. *Pennsylvania* and *New York* in 350-lb. kegs, per lb.: Greek Naxos, 6½c.; Turkish, 6½c.; Khasia, 5½c.; domestic, 3½c. Market good.

Feldspar — F.o.b. mine or grinding plant:

North Carolina: No. 1 pottery grade, $6@$6.50 per long ton, depending upon quality. Market fair.

New Hampshire: No. 1, not over 10 per cent SiO_2, $8 per short ton. Ground, $17. Market fair.

New York: Per ton, f.o.b. cars, No. 1 crude, $8. Market good.

Maine: No. 1, ground, $19 per ton. Heavy demand.

Tennessee: No. 1 pottery, $16@$18 per ton for 140 and 200 mesh respectively; No. 1 enamel, 140 mesh, $15; 200 mesh, $18. Competition keen with some cutting of prices to get business, but demand good.

Maryland: Enamelers' grade, No. 1, $16; Glassmakers' grade, No. 1, $15; No. 2, $11.50.

Canada, f.o.b. mine: High potash, $9, f.o.b. per ton Quebec; crude, No. 1, over 12½ per cent potash, less than 5 per cent free SiO_2, $7.50@$8; crude, No. 2, 20 to 25 per cent free SiO_2, $5.50@$5.75.

Ground, No. 1, 180 mesh, $20.50 per ton, bags included; demand very active for first-grade feldspar.

Fluorspar—F.o.b. *Kentucky* and *Illinois* mines, per ton:

Gravel, not less than 85 per cent CaF_2, and not over 5 per cent SiO_2, $16@$18. Foundry lump, 85-5, $19@$19.50. Ground, 95 to 98 per cent CaF_2, and not over 2½ per cent SiO_2, $32.50. Acid ground packed in bags $40@$45. Volume of sales small, but prices firm.

Canada, 84@86 per cent CaF_2, less than 5 per cent silica, $16.

Market for gravel and lump is very quiet and large imports are blamed. Prices continue below cost of production at many mines. Market for ground fluorspar is good, however.

Fuller's Earth—Per ton, f.o.b. *Midway, Fla.:* 16 to 30 mesh, $16.50; 30 to 60 mesh, $18; 60 to 100 mesh, $15; 100 mesh "up," $8; 200 mesh "up," $15. Market fair.

Powdered, imported, duty paid, $23@$25 per ton.

Garnet—Per ton f.o.b. mines:

Domestic, $85; *Canadian*, $70@$80.

Spanish grades, $60, c.i.f. port of entry.

Gilsonite—Per ton, carload lots, f.o.b. mines *Colorado:*

Jet asphaltum, $36; selects, $33; seconds (ordinary grades), $25.50; peerless black, $32.90. Market steady.

Graphite—F.o.b. New York per lb.:

Ceylon lump, 8½@9½c.; chip, 7@7¾c.; dust, 3½@5c. Market fair.

Flake, 12@30c. according to grade; fine ground, crystalline, 5c.@25c.; amorphous ground graphite, 5@18c. Crude amorphous graphite, $15@$35 per ton.

Market is gradually improving.

Greensand—Per ton, f.o.b. cars, *New Jersey:* screened and bagged, $25 in carload lots. Market improving. Being used as a dressing for lawns and golf grounds and as a mineral for water softening.

Gypsum—Per ton f.o.b. mill, depending upon location: crushed, $1.50@$3; ground, $4@$6; agricultural, $6@$7; calcined, $8@$11.

Ilmenite—Concentrates, 52 per cent TiO_2, 1½c. per lb., f.o.b. *Virginia* points. $60 per short ton, *Florida* mines.

Iron Oxide (See Ocher)—Standard Spanish red, 3@3¾c. per lb.; domestic earth, 2@4½c. Market a little stronger.

Kaolin—See China Clay.

[1]**Lepidolite**—$20@$30 per ton for ordinary grades. Nominal.

Limestone—F.o.b. shipping points, depending on location: crushed, ½ in. and less, 90c.@$2; 3 in. and larger, 90c. @$1.80 per ton.

Agricultural, 60c.@$5 for pulverized, depending upon source, purity, and fineness.

Magnesite—Per short ton, f.o.b. *California* mines: Grade "A," $40; Grade "B," $38.

Dead-burned, $40, f.o.b. Eastern seaboard. Market unsettled.

Manjak—Barbados, in 10-ton lots, c.i.f. New York: grade "A," 6c. per lb.; grade "AA," fine, 8c.

Mica—F.o.b. plant, per ton:

North Carolina: 20 mesh, roofing, $38; 100 mesh, white ground, $70. Market good.

New Hampshire:

Mine run, $340; clean shop scrap, $25; mine scrap, $20.

White, dry ground, 20 mesh, $30; 40 mesh, $45; 60 mesh, $60; 100 mesh, $75; 200 mesh, $85. Market good. Grinders appear to be behind orders on some meshes.

Madagascar, amber, dark, free from iron, per lb., f.o.b. *New York*, duty paid: special grade, $3@$3.25; No. A 1, $2.60@$2.75; No. 1, $2.20@$2.25; No. 2, $1.80@$2; No. 3, $1.10@$1.20; No. 4, 60@70c. No. 5, 42@45c.

[1]**Monazite**—Minimum 6 per cent ThO_2, $120 per ton.

Ocher — F.o.b. *Georgia* mines, per ton: $22.50@$25 in sacks; $25@$30 in barrels; washed and water floated, $25 @$28. Market fair to good.

Phosphate—Per long ton, f.a.s. or f.o.b. mines:

Florida, pebble, f.a.s., for export: 76@77 per cent, $6.25; 75 per cent, $5.65; 74@75 per cent, $5.40; 70 per cent, $3.40; 68 per cent, $3.25. Market firm.

Tennessee, lump, 68 to 72 per cent, $4.50@$5.50; ground, 65 to 72 per cent, $4@$7.

Potash—	Bags	Bulk
Muriate of potash 80@85 per cent, basis 80 per cent....	$34.90	$33.65
Sulphate of potash 90@95 per cent. basis 90 per cent....	45.85	44.60
Sulphate of potash-magnesia 48@53 per cent, basis 48 per cent	26.35	25.10
Manure salt 30 per cent.....	20.00	18.00
Manure salt 20 per cent.....	13.35	11.35
Kainit 14@16 per cent.....	10.50	8.50
Kainit 12.4 per cent.....	10.00	8.00

Two thousand pounds net weight, c.i.f. Atlantic and Gulf ports. German weights, tares and analyses.

Discounts: 5 per cent on minimum of 50 tons K_2O; 6 per cent on 100 tons; 7 per cent on 300 tons; 10 per cent on 500 tons. Prices guaranteed against sellers' decline until April 30, 1926. Heavy volume of business booked this season.

Pumice Stone—In barrels, per lb. powdered, 2½@5c.; lumps, 4½@6c. lumps in bags, 4@6c.

Pyrites—Tharsis, per long ton unit of sulphur, c.i.f. U. S. ports: furnace size, 13c. Cinder from ore to remain property of buyers. Market poor, only Coast plants being served. Brimstone at $20, c.i.f., is helping and if it should go to $22.50 it is believed pyrites demand would come back in volume.

[1]**Quartz Rock Crystals**—Colorless, clear and flawed, pieces ¼ to ½ lb. in weight, 40c. per lb. in ton lots. For optical purposes, double above prices.

Rutile—*Virginia*, per lb.; granular, 94@96 per cent TiO_2, 12@15c.; pulverized, 100 mesh, 94@96 per cent, 17@ 30c.

Florida 93 per cent TiO_2, $200 per ton.

Silica—Water ground and floated, per ton f.o.b. *Illinois:* 450 mesh, $31; 250 mesh, $22.

Glass sand, $1@$5 per ton; brick and molding sand, 30c.@$2; blast sand, $2.50@$4.50.

[1]**Spodumene**—$20@$30 per ton, depending upon lithium content. Nominal.

Sulphur—$15@$16 per ton for domestic, f.o.b. *Texas* mines; $19@$20 for export, f.a.s. *New York.*

Talc—Per ton, carload lots, f.o.b. works, containers included:

Vermont: 200 mesh, extra white, $11; 180 mesh, medium white, $10; packed in 50-lb. paper bags. Demand good so far this year with slight weakening in October.

New York: Double air-floated, 200 mesh, $13.75; 325 mesh, $14.75. Demand fair.

Georgia: Powdered, gray, $7.50@$10; yellow, $9@$12; red, $11@$13; roofing, $7.50@$9. Market fair.

New Jersey: Soapstone, ground, $9@$12; market fair.

Tripoli—Per short ton, burlap bags, paper liners, minimum carload 30 tons, f.o.b. *Missouri*: Once ground through 40 mesh: rose and cream colored, $20; white, $18@$27. Double ground through 110 mesh: rose and cream, $17@$25; white, $19@$30. Air-float through 200 mesh: rose and cream, $35@$40; white, $40; mill run, $15. Usual active fall business.

[1]**Zircon**—Freight allowed east of Mississippi River:

99 per cent, 3c. per lb., f.o.b. *Florida*, in carload lots.

[1]Price furnished by Foote Mineral Co., Philadelphia.

Mineral Products

Arsenious Oxide (white arsenic)—3.50c. per lb. delivered. A few carloads sold. In Ontario, 4c. per lb.; market poor. London £16 per long ton.

Copper Sulphate — Large crystals, 4.50@4.80c. per lb.; small, 0.1c. less.

Sodium Nitrate — Spot, $2.59@$2.67 per 100 lb., ex vessel Atlantic ports.

Sodium Sulphate—90c.@$1.30 per 100 lb., f.o.b. works, for Glauber's salt.

Zinc Oxide—Per lb. in bags:

Lead free, 7¼c.; 35 per cent leaded grades, 8c.; French, 10½@12½c.

Ferro-Alloys

[1]**Ferrocerium**—$7 per lb.

Ferrochrome — 0.1 per cent carbon, 35c. per lb. of contained chromium; 2 per cent carbon, 23c. per lb.; 4 to 6 per cent carbon 11½c. per lb.

Ferromanganese—Domestic and foreign, 78@82 per cent, $115 per gross ton. Spiegeleisen, 19@21 per cent, $33@$34 f.o.b. furnace; 16@19 per cent, $32.

Ferrophosphorus—Electrolytic, 18 per cent P, $91 per ton; 24 per cent, $122.50; f.o.b. Ala. and Tenn.

Ferrosilicon—14 to 16 per cent, $42 @$47 per gross ton, f.o.b. works; 50 per cent, $85 delivered; 75 per cent, $155. Market active.

Ferrotitanium—For 15 to 18 per cent material, $200 per ton, f.o.b. Niagara Falls, N. Y.

Ferrotungsten—$1.14@$1.20 per lb. of contained W, f.o.b. works, according to grade. Prices firm with tendency to advance.

[1]**Ferro-uranium**—30 to 40 per cent U, $4.50 per lb. of U contained, f.o.b. works in 500-lb. lots.

Ferrovanadium — Per lb. of V contained, f.o.b. works, $3.25@$3.75.

Metal Products

Rolled Copper—Sheets, 23¾c.; wire, 16½c.

Lead Sheets—Rolled, 13¼c.; clipped, 13½c.

Nickel Silver—29½c. per lb. for 18 per cent nickel Grade A sheets.

Yellow (Muntz) Metal — Dimension sheets, 20⅜c. per lb.; rods, 17⅜c. per lb.

Zinc Sheets—11¾c. per lb., f.o.b. works.

Refractories

Chrome Brick—$45@$48 per net ton, f.o.b. shipping point.

Firebrick—First quality, $43@$46 per M., Ohio, Kentucky, Central Pennsylvania; second quality, $35@$40.

Magnesite Brick—9-in. straights, $65 per net ton, f.o.b. works.

Silica Brick — $40 per M. Pennsylvania and Ohio, $48@$52 Alabama.

[1]**Zirkite**—Powdered, 80 per cent ZrO_2, 2½c. per lb. Brick, straights, 80c.@$1 each.

Metal Statistics

Monthly Average Prices of Metals

Silver

	New York		London		Sterling Exchange	
	1924	1925	1924	1925	1924	1925
January	63.447	68.447	33.549	32.197	425.524	477.702
February	64.359	68.472	33.565	32.245	430.457	476.886
March	63.957	67.808	33.483	31.935	428.769	477.279
April	64.139	66.899	33.065	31.372	434.788	479.034
May	65.524	67.580	33.870	31.276	435.716	484.960
June	66.690	69.106	34.758	31.863	431.675	485.553
July	67.159	69.442	34.509	31.954	436.649	485.514
August	68.519	70.240	34.213	32.268	449.510	485.264
September	69.350	71.570	34.832	32.983	445.740	484.270
October	70.827	71.106	35.387	32.972	448.274	483.909
November	69.299	.....	33.775	.....	460.543	.....
December	68.096	.....	32.620	.....	469.115	.....
Year	66.781	.....	33.969	.....	441.397	.....

New York quotations, cents per ounce troy, 999 fine, foreign silver. London pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		Electrolytic	
	1924	1925	1924	1925	1924	1925
January	12.401	14.709	61.273	66.065	67.193	70.607
February	12.708	14.463	63.113	64.713	68.167	69.525
March	13.515	14.004	66.137	62.892	72.087	67.739
April	13.206	13.252	64.338	60.575	70.150	64.194
May	12.772	13.347	62.006	60.131	67.648	63.560
June	12.327	13.399	61.375	59.899	66.313	63.369
July	12.390	13.946	61.652	61.467	65.815	65.750
August	13.221	14.490	63.481	62.613	67.800	68.169
September	12.917	14.376	62.750	61.886	67.125	67.693
October	12.933	14.300	62.641	61.977	66.620	67.523
November	13.635	.....	63.731	.....	68.063	.....
December	14.260	.....	65.295	.....	69.762	.....
Year	13.024	.....	63.149	.....	68.062	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

Lead

	New York		St. Louis		London	
	1924	1925	1924	1925	1924	1925
January	7.972	10.169	8.002	9.953	31.528	41.443
February	8.554	9.428	8.643	9.126	34.589	37.944
March	9.013	8.914	8.891	8.578	37.161	36.804
April	8.263	8.005	7.932	7.662	32.819	32.791
May	7.269	7.985	6.973	7.780	29.426	32.283
June	7.020	8.321	6.948	8.024	32.138	33.479
July	7.117	8.151	6.886	8.054	32.916	34.698
August	7.827	9.192	7.764	9.284	32.728	38.188
September	8.000	9.508	7.876	9.303	33.023	38.884
October	8.235	9.513	8.118	9.299	35.715	39.017
November	8.689	.....	8.590	.....	39.425	.....
December	9.207	.....	9.106	.....	41.583	.....
Year	8.097	.....	7.969	.....	34.421	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Tin

	New York				London	
	99%		Straits			
	1924	1925	1924	1925	1924	1925
January	48.250	57.692	48.750	58.250	246.790	265.560
February	52.772	56.517	53.272	57.068	272.399	262.181
March	54.370	53.038	54.870	53.733	277.429	245.682
April	49.457	51.380	49.957	52.135	250.863	237.006
May	43.611	53.675	44.111	54.620	218.511	245.476
June	42.265	54.885	42.765	55.957	219.219	252.476
July	45.750	56.683	46.250	58.014	233.332	258.435
August	51.409	56.649	51.909	58.190	254.638	258.538
September	48.595	56.405	49.095	58.247	243.511	259.182
October	50.038	60.462	50.538	62.274	248.543	259.091
November	53.848	.....	54.348	.....	257.738	277.722
December	55.721	.....	56.245	.....	261.875	.....
Year	49.674	.....	50.176	.....	248.737	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

Zinc

	St. Louis		London		
	1924	1925	1924	1925 Spot	1925 3 M
January	6.426	7.738	34.761	37.917	.....
February	6.756	7.480	36.518	36.528	.....
March	6.488	7.319	35.298	35.741	.....
April	6.121	6.985	32.588	34.644	.....
May	5.793	6.951	30.648	34.223	.....
June	5.792	6.990	31.788	34.149	.....
July	5.898	7.206	32.193	34.894	34.511
August	6.175	7.376	32.544	36.691	36.219
September	6.181	7.753	32.926	37.435	36.719
October	6.324	8.282	33.514	39.884	38.656
November	6.796	.....	35.022	.....	.....
December	7.374	.....	36.932	.....	.....
Year	6.344	.....	33.728	.....	.....

St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Antimony, Quicksilver and Platinum

	Antimony (a)		Quicksilver (b)		Platinum (c)		
	New York		New York		Refined New York		Crude
	1924	1925	1924	1925	1924	1925	1925
January	10.279	17.428	59.500	81.596	122.115	117.000	111.663
February	10.935	19.795	59.565	79.386	124.739	117.000	114.216
March	11.442	15.553	64.269	80.481	121.692	117.000	115.000
April	9.952	12.553	74.308	82.327	115.577	118.269	114.769
May	8.755	15.770	76.962	81.360	115.731	119.850	115.000
June	8.403	16.500	73.720	83.154	116.000	120.000	115.000
July	8.477	17.779	72.173	83.077	118.231	120.000	114.346
August	9.839	17.683	72.096	82.317	120.000	120.000	112.538
September	11.022	17.143	72.423	81.730	118.923	120.000	113.710
October	11.519	18.029	70.654	83.856	118.000	120.000	113.918
November	14.385	.....	68.708	.....	117.792	.....	.....
December	15.024	.....	72.750	.....	117.000	.....	.....
Year	10.836	.....	69.761	.....	118.817	.....	.....

(a) Antimony quotations in cents per pound for ordinary brands. (b) Quicksilver in dollars per flask. (c) Platinum in dollars per ounce.

Pig Iron, Pittsburgh

	Bessemer		Basic		No. 2 Foundry	
	1924	1925	1924	1925	1924	1925
January	24.76	24.66	23.76	23.76	23.88	23.76
February	25.26	24.50	23.76	23.26	25.06	23.76
March	25.14	24.06	23.76	23.06	24.76	22.91
April	24.56	22.89	23.26	21.76	23.80	22.26
May	23.89	21.57	22.08	20.26	22.91	21.16
June	22.90	20.76	21.49	19.76	21.48	20.11
July	21.90	20.76	20.76	19.76	20.76	20.26
August	21.76	20.76	20.76	19.76	20.99	19.26
September	21.76	21.04	20.76	20.03	21.68	20.50
October	21.76	21.50	20.26	20.37	21.26	20.83
November	22.08	.....	21.44	.....	21.17	.....
December	23.65	.....	22.04	.....	22.86	.....
Year	23.28	.....	22.01	.....	22.55	.....

In dollars per long ton.

Monthly Crude Copper Output in Short Tons

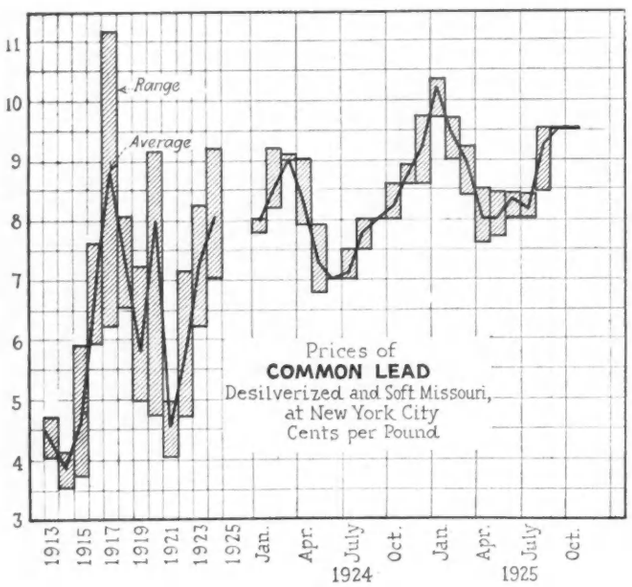
	1925				
	April	May	June	July	August
Domestic					
Alaska shipments	3,665	2,877	2,848	3,643	67
Calumet & Arizona	2,598	2,205	1,924	1,876	1,970
Miami	2,194	2,209	2,190	1,861	2,350
New Cornelia	3,168	3,346	3,115	2,834	2,460
Old Dominion	1,275	1,418	1,381	1,120	1,030
Phelps Dodge	6,898	7,054	7,214	6,878	6,600
United Verde Extension	1,905	1,812	1,565	1,931	1,928
Tennessee Copper	.....	.....	.....	549	610
Imports: Ore and concentrates, matte	9,011	12,638	6,898	5,261	6,485
Imports of black and blister, unrefined	20,128	15,706	26,349	16,796	23,309
Imports of refined and old	4,254	4,386	7,298	2,461	4,348
Foreign					
Boleo, Mexico	55	.....	847	791	832
Falcon Mines, Rhodesia	.....	.....	.....	211	.....
Furukawa, Japan	1,684	1,315	1,390	1,615	.....
Granby Cons., Canada	1,058	1,765	1,653	1,620	1,669
Katanga, Africa	7,717	8,998	9,415	9,045	10,000
Mount Morgan, Aust	361	499	403	415	.....
Mount Lyell, Aust	.....	.....	2,021(a)	.....	.....
Phelps Dodge, Mexican	1,641	1,573	1,764	1,982	2,118
Sumitomo, Japan	1,723	569	1,412	1,570	.....

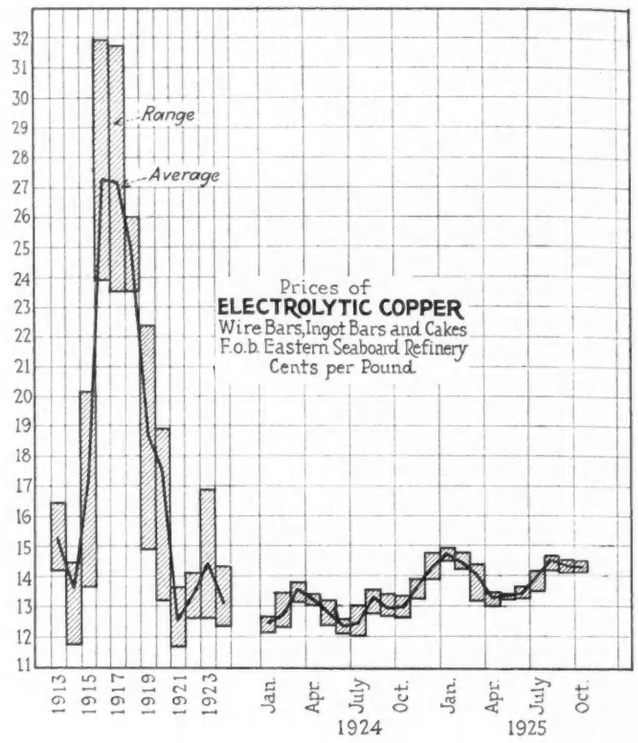
(a) Three months.

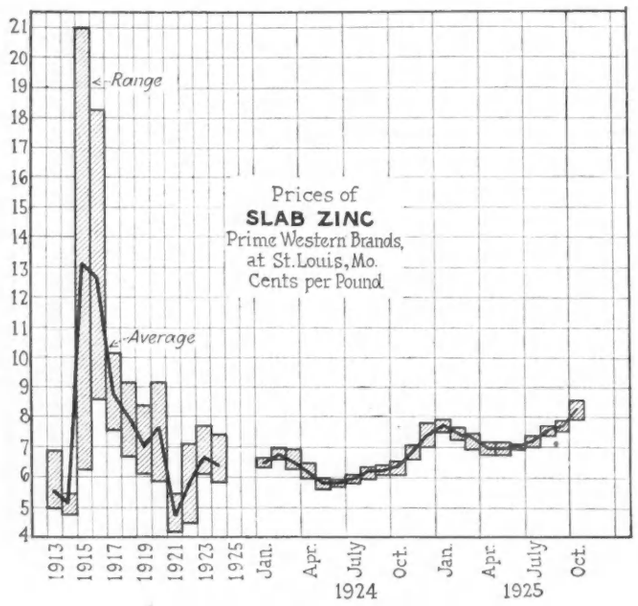
Monthly Production of Primary Copper from U. S. Mines and Daily Rate (Short Tons)

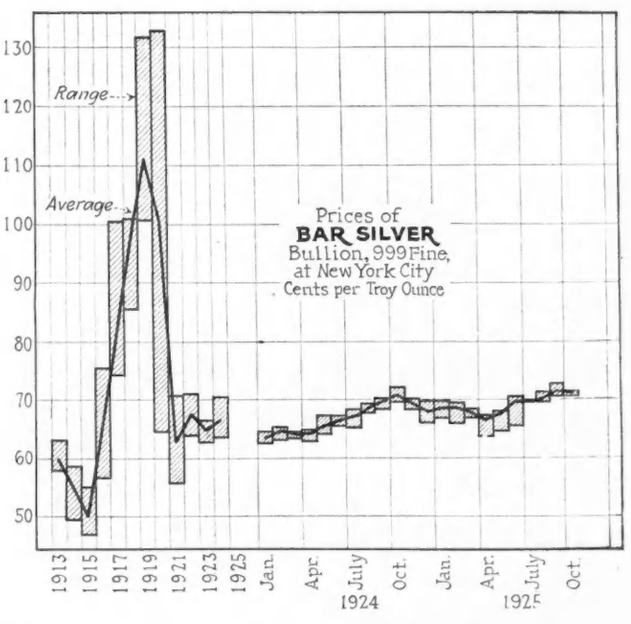
	1923		1924		1925	
	Monthly Production	Daily Rate	Monthly Production	Daily Rate	Monthly Production	Daily Rate
January	56,134	1,811	66,631	2,149	74,789	2,412
February	51,368	1,834	65,681	2,265	68,967	2,463
March	60,781	1,961	65,181	2,103	74,901	2,416
April	59,078	1,969	66,073	2,202	70,667	2,356
May	62,718	2,023	65,608	2,116	70,574	2,276
June	62,740	2,091	63,933	2,131	69,894	2,330
July	63,071	2,034	64,787	2,090	68,507	2,210
August	65,865	2,125	66,756	2,153	68,090	2,196
September	62,255	2,075	63,800	2,127	67,393	2,246
October	66,035	2,130	68,989	2,225	.....	.....
November	63,885	2,129	68,291	2,276	.....	.....
December	64,832	2,091	67,647	2,182	.....	.....
Total	738,763	.....	793,377	.....	633,782	.....
Monthly average	61,564	.....	66,115	.....	70,420	.....
Average of daily rates	.....	2,024	.....	2,168	.....	2,322

Metal Price Curves

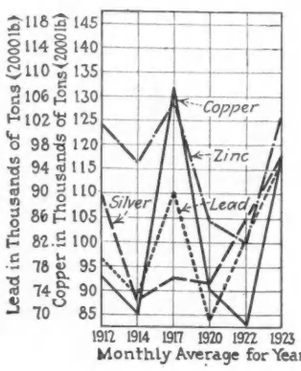


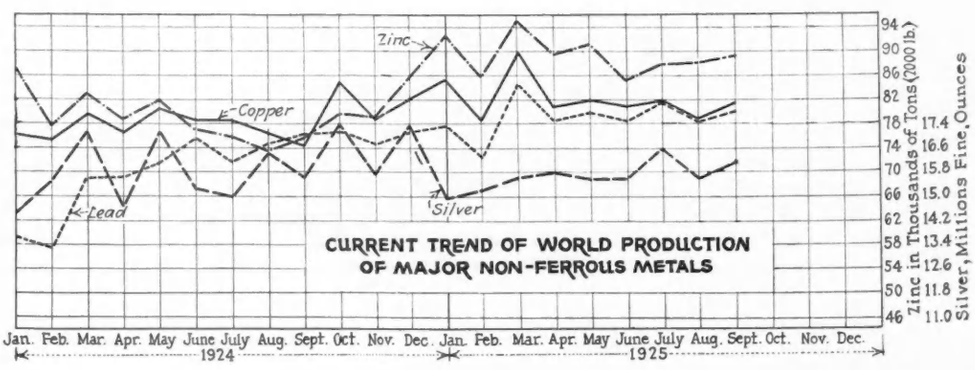






THE curves below are not to be considered as permanent records of production. They show merely the current trend according to latest estimates of the American Bureau of Metal Statistics. The figure for copper represents reports from countries producing about 97 per cent of the world's total in 1923 and 1924, to which is added an estimate for the remaining 3 per cent. Countries that in 1923 and 1924 produced 78.5 per cent of the lead, 87.5 per cent of the zinc, and 81 per cent of the silver are represented in the respective curves, with no estimate for non-reporting countries.




Zinc
Copper
Lead
Silver
CURRENT TREND OF WORLD PRODUCTION
OF MAJOR NON-FERROUS METALS
Zinc in Thousands of Tons (2000 lb)
Silver, Millions Fine, Ounces
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1924 1925

Imports and Exports of Ores and Metals in September, 1924 and 1925

Compiled by the U. S. Department of Commerce

In pounds unless otherwise specified

Imports

	September, 1924	September, 1925
Antimony		
Ore	227,560	612,874
Liquated, regulus, or metal	452,378	846,220
Copper		
Ores	9,716,514	4,806,437
Concentrates	1,971,823	3,790,728
Regulus, coarse metal and other forms	70,682	82,874
Imported from		
Spain	631,793	603,893
Canada	319,724	1,969,139
Mexico	1,800,113	1,926,541
Cuba	2,560,000	1,859,200
Chile	5,939,411	1,827,123
Colombia	.....	.....
Peru	29,871	161,447
Venezuela	.....	.....
Other countries	478,107	332,696
Unrefined, black, blister, and converted copper in pigs, bars and other forms	27,024,684	33,630,727
Imported from		
Spain	1,266,570	3,333,870
United Kingdom	21,804	76,965
Canada	1,993,857	5,444,692
Mexico	4,512,257	3,267,773
Chile	8,022,886	5,071,268
Peru	3,824,548	6,989,323
Portuguese Africa	6,141,793	6,087,001
Other countries	1,240,969	3,359,835
Refined copper	14,878,475	10,034,901
Old and clippings for remanufacture	236,443	848,658
Composition metal, copper chief value	108	20,430
Copper manufactures	101,070	41,900
Brass		
Old and clippings for remanufacture	553,121	1,345,454
Manufactures of brass	75,695	118,383
Lead		
Ore and matte	13,431,371	5,405,859
Bullion or base bullion	12,346,031	12,229,738
Pigs, bars, other forms, and old	12,376	.....
Manufactures of, except type metal	19,066	38,481
Manganese ore, long tons	6,141	22,709
Pyrites, long tons	18,468	23,844
Tin		
Tin ore, tons	.....	33
In blocks, bars, and pigs	11,766,344	12,018,550
From		
United Kingdom	3,783,257	3,427,791
British Straits Settlements	7,822,572	7,561,692
Dutch East Indies	.....	58,400
Hongkong	70,919	45,179
Australia	22,400	168,000
Other countries	67,196	757,488
Zinc		
Ore, Free	.....	.....
Dutiable	63,180	318,433
Blocks, pigs, and other forms	1,050	5,962
Zinc dust	10,098	6,769

Exports of Copper, Lead and Zinc

	September, 1924	September 1925
Copper		
Ores, concentrates, matte, and regulus	1,514	325
Copper and manufactures of	99,774,684	71,040,112
Refined in ingots, bars, and other forms	89,819,954	61,414,414
Exported to		
Belgium	7,710,055	5,908,593
France	18,543,706	9,569,644
Germany	27,215,201	13,667,803
Italy	8,092,189	7,501,538
Netherlands	3,845,613	3,050,486
Spain	919,508	145,440
Sweden	2,858,049	2,927,945
United Kingdom	12,957,181	14,757,887
Canada	3,492,861	2,236,437
British India	264,205	.....
China	1,852,705	.....
Japan	1,657,632	839,812
Other countries	411,049	808,829
Old and scrap copper	596,761	765,222
Pipes and tubes	248,897	477,659
Plates and sheets	615,653	825,632
Rods	4,896,129	4,866,385
Wire	1,071,601	682,755
Insulated copper wire and cable	1,081,918	1,407,218
Other manufactures of copper	1,443,771	600,827
Lead		
Pigs, bars, and other forms		
From domestic ore	49,716	371,909
From foreign ore	20,629,594	9,923,972
Exported to		
France	1,914,859	1,344,136
Germany	2,505,083	2,229,219
Italy	761,923	896,165
Netherlands	1,009,048	448,152
United Kingdom	12,233,434	3,696,810
Other Europe	56,053	784,243
Argentina	236,467	336,118
Brazil	635,434	337,073
Japan	1,120,000	.....
Other countries	307,009	224,965
Other lead manufactures	1,897,395	732,635
Zinc		
Dross	.....	3,533,534
Ores and concentrates, tons	889	12,149
Zinc (spelter) in slabs, blocks, or pigs	11,796,632	8,834,473
Exported to		
Belgium	112,013	1,672,057
France	1,153,763	896,105
Germany	1,299,579	1,307,103
Italy	56,010	1,904,345
United Kingdom	8,862,706	2,478,132
Other Europe	.....	246,593
Canada	68,383	67,144
Other countries	244,178	262,994
In sheets, strips, and other forms	575,538	803,812
Zinc dust	386,854	348,405
Other zinc manufactures	96,082	210,407

Small Increase in September Lead Production

The American Bureau of Metal Statistics furnishes the following figures (in tons of 2,000 lb.) showing the monthly output of pig lead by the countries, which in 1923 furnished about 78 per cent of the world's total, and in 1924 about 79 per cent:

	May	June	July	Aug.	Sept.	Jan.-Sept
United States (a)	47,316	48,775	46,552	46,223	45,538	419,576
Mexico	17,468	16,776	17,208	16,635	15,434	151,063
Canada	9,211	8,736	9,466	10,118	9,965	91,610
Total North America (b)	73,995	74,287	73,226	72,976	70,937	662,249
Spain and Tunis (c)	12,363	10,807	9,216	8,213	10,567	94,199
Italy	603	457	2,289	2,590	1,984	9,923
Australia	13,205	12,980	14,465	13,088	15,456	119,679
Burma	4,089	4,092	4,260	4,260	4,480	38,944
Rhodesia	.....	339	680	620	451	2,618
Transvaal	284	274	168	194	86	1,250
Total	104,539	103,236	104,304	101,941	103,961	928,862

(a) Crude lead; includes only production reported by smelters who are members of this bureau. Pig lead produced from Canadian and Mexican ores has been deducted and credited to its country of origin. (b) The total for North America is a correct statement of the aggregate production of crude lead by the smelters of the several countries, but the distribution according to countries is not precise, particularly as between the United States and Canada, an accurate allocation by months being at present impossible. (c) Incomplete.

A. Z., L. & S. Co. Profits Drop

In the quarter ending on Sept. 30, 1925, the American Zinc, Lead & Smelting Co. reports a profit, before depreciation and depletion, of $66,620, compared with $86,230 in the preceding quarter and $96,674 in the same quarter of 1924. The profit for the first nine months of 1925, before allowing for depreciation and depletion, was $367,149, compared with $185,533 in the same period of 1924.

Texas Gulf Sulphur Co.

For the three months ended Sept. 30, 1925, the Texas Gulf Sulphur Co. made net earnings of $1,478,846.68. With this amount added, its total surplus and reserve for depletion at Sept. 30, 1925, was $7,471,509.19, after having paid a dividend of $1,270,000 on Sept. 15, 1925. During these three months the company also increased its reserves, including reserve for depreciation and for unpaid federal taxes (accrued), by $344,681.21, making the total of these reserves $5,959,739.13 at Sept. 30, 1925.

September Zinc Production Up

The American Bureau of Metal Statistics gives the output of slab zinc (in tons of 2,000 lb.) by countries which in 1923 furnished about 88 per cent of the world's total, and in 1924 about 87 per cent, for recent months:

	May, 1925	June, 1925	July, 1925	Aug., 1925	Sept., 1925	Jan.-Sept., 1924	Jan.-Sept., 1925
United States	49,738	45,921	47,583	47,849	47,384	403,014	436,008
Canada	2,651	2,492	2,820	3,660	4,024	21,353	26,215
Mexico	.....	.....	.....	100	135	.....	235
Belgium	15,763	14,771	14,650	14,319	15,624	132,198	139,721
Germany	5,700	5,200	5,400	5,200	5,100	.....	49,000
Polish Silesia	9,200	8,500	8,600	9,100	8,800	83,044(b)	79,475
Australia	4,236	4,065	4,436	4,409	4,267	39,076	38,196
Gt. Britain (a)	3,976	4,312	4,256	3,494	3,752	31,013	35,514
Total	91,264	85,261	87,745	88,131	89,086	709,698	804,364
Estimated for non-reporting countries	13,600	12,700	13,000	13,200	13,300	106,000	120,100
World's total	104,900	98,000	100,800	101,300	102,400	815,700	924,500

(a) Estimated by A. J. M. Sharpe. (b) Annual data showed this figure to be too low.

Mining Stocks—Week Ended October 31, 1925

Stock	Exch.	High	Low	Last	Last	Div.
COPPER						
Anaconda	New York	49⅜	45½	49½	Oc.17,No.23,Q	0.75
Arcadian Consol.	Boston	1⅛	1⅛	1⅛		
Ariz. Com'l.	Boston	13⅞	12½	13¼	Jy.21,Jy. 31 SA	0.50
Calaveras	N. Y. Curb	4	3⅞	3⅞		
Calumet & Arizona	New York	54⅜	52½	53½	Se.4, Se.21 Q	1.00
Calumet & Hecla	Boston	15	14½	15	Au.31, Se.15 Q	0.50
Canario Copper	N. Y. Curb			5		
Cerro de Pasco	New York	63⅛	60⅜	62	Oc.22, Nov.2 Q	1.00
Chile Copper	New York	35⅛	34	35⅛	Dec.2, Dec.28, Q	0.62½
Chino	New York	23½	22½	23	Sept., 1920	0.37½
Con. Coppermines	N. Y. Curb	2⅜	2	2		
Copper Range	Boston	21⅝	19⅞	21⅜	Ap.9, My.4	1.00
Crystal Copper	Boston Curb	*36	*31	*34		
East Butte	Boston	4⅜	4¼	4⅜	Dec., 1919	0.50
First National	Boston Curb	*26	*23	*25	Feb., 1919	0.15
Franklin	Boston	*85	*80	*85		
Granby Consol.	New York	20⅞	19⅛	20⅛	May, 1919	1.25
Greene-Cananea	New York	16⅞	12⅜	16	Nov., 1920	0.50
Hancock	Boston			*70		
HoweSound.new,r.t.c.	New York	31	28½	31	Oc.5, Oc. 15 Q	0.50
Inspiration Consl.	New York	28⅛	27⅛	28	Se.17, Oc.5, Q	0.50
Iron Cap	Boston Curb	2⅜	2⅜	2⅜	May, 1923	0.15
Isle Royale	Boston	13	11⅞	12⅞	Sept., 1923	0.50
Jerome Verde Dev.	N. Y. Curb	1.00	*80	1.00		
Kennecott	New York	58	56⅛	57⅛	Se.11, Oct.1 Q	0.75
Lake Copper	Boston	1⅜	1⅜	1⅜	Jn.1, Jn.15 Q	0.50
Magma Copper	New York	44⅝	43½	44⅝	Oct.1, Oct.15,	0.75
Mason Valley	N. Y. Curb	2½	2	2⅛		
Mass Consolidated	Boston	*90	*75	*90	Nov., 1917	1.00
Miami Copper	New York	9⅞	9⅜	9⅜	No.2, No.16 Q	0.25
Mohawk	Boston	35⅛	34	34⅜	Oc.31, De.2	1.00
Mother Lode Coa.	New York	7⅛	7	7⅛	Jn. 12, Jn. 30	0.37½
Nevada Consol.	New York	15⅛	14⅛	14⅝	Sept., 1920	0.25
New Cornelia	Boston	19⅝	19⅜	19⅝	No.6, No.23 Q	0.25
North Butte	Boston	2⅞	1⅞	2⅛	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	*94	*85	*88	No. 14, De. 2	0.05
Old Dominion	Boston	21	19½	21	Dec., 1918	1.00
Phelps Dodge	Open Mar.	†138	†135		Se.19, Oc.2 Q	1.00
Quincy	Boston	26	23⅞	26	Mar., 1920	1.00
Ray Consolidated	New York	14⅝	13⅞	14⅛	Dec., 1920	0.25
Ray Hercules	N. Y. Curb			14		
St. Mary's Min. Ld.	Boston	37	34½	36½	Ap.20, My.20,	3.00
Shannon	Boston	*90	*55	*85	Nov., 1917	0.25
Shattuck Arizona	New York	6⅝	6⅛	6⅜	Jan., 1920	0.25
Superior & Boston	Boston	1⅜	1⅛	1⅛		
Tenn. C. & C.	New York	14⅜	12⅝	14	De.31, Ja.15,Q	0.25
United Verde Ex.	N. Y. Curb	26½	26	26½	Oc. 6, Nov. 20	0.75
Utah Copper	New York	101⅛	101	101	Se. 18, Se. 30, Q	1.00
Utah Metal & T.	Boston	*69	*60	*67	Dec., 1917	0.30
Victoria	Boston			*55		
Walker Mining	Salt Lake	1.95	1.82½	1.82½		
NICKEL-COPPER						
Internat. Nickel	New York	39½	36½	39⅜	Se.11, Se.30, Q	0.50
Internat. Nickel, pfd.	New York			100⅜	Oc.15, No.2, Q	1.50
LEAD						
Gladstone M. M. Co.	Spokane	*24	*23½	23½	No. 1, No. 10 M	0.0½
National Lead	New York	172½	160	167½	N.20, De.15 Q	1.75
National Lead pfd.	New York	118	118	118	Aug.21, Se.15	1.75
St. Joseph Lead	New York	45¾	43	44½	Nov.10,De.21Q	1.05
ZINC						
Am. Z. L. & S.	New York	10¼	8⅞	9⅛	May., 1920	1.00
Am. Z. L. & S, pfd.	New York	37¾	34¾	34¾	Nov., 1920	1.50
Butte C. & Z.	New York	7⅞	7⅜	7⅜	De.10, De.24	0.50
Butte & Superior	New York	12⅞	11⅝	12	Se.18, Se.30	0.50
Callahan Zn-Ld.	New York	2⅛	1⅞	2	Dec., 1920	0.50
New Jersey Zn.	N. Y. Curb			203	No.20,Dec.10 X	2.00
United Zinc	N. Y. Curb			*20		
Yellow Pine	Los Angeles	*60	*28½	*50	Se.10 Se.21 Q	0.04
GOLD						
Alaska Juneau	New York	2½	2⅛	2⅛		
Argonaut	Toronto	*19	*12½	*17		
Barry-Hollinger	Toronto	*29	*26	*28½		
Carson Hill	Boston	*55	*35	*35		
Consol. W. Dome L.	Toronto	*14¼	*12¼	*13½		
Cresson Consol. G.	N. Y. Curb	2⅜	2⅜	2⅜	Se.30, Oc.10	0.10
Crown Reserve	Toronto	*20	*16½	*19½	Jan., 1917	0.05
Dome Mines	New York	16⅜	14⅝	15½	Se.30, Oc.20, Q	0.50
Golden Cycle	Colo. Springs			1.51	No.30, Dec.10 Q	0.03
Hollinger Consol.	Toronto	17.25	16.90	17.20	Oc.19, Nov.4	0.08
Homestake Mining	New York	48	48	48	Oc.20, Oc.26 M	0.50
Kirkland Lake	Toronto	*69	*66½	*68		
Lake Shore	Toronto	8.35	7.88	8.30	Se.1, Se.15	0.05
McIntyre-Porcupine.	New York	22⅜	19⅞	21⅞	No.2, De.1 Q	0.25
Newray	Toronto	*33	*23	*30		
Night Hawk Pen.	Toronto	*12	*10	*10		
Portland	Colo. Springs			*43	Oct., 1920	0.01
Rand Mines	New York	35⅜	35⅜	35⅜	Au.17, Au.25	1.52
Teck-Hughes	Toronto	2.16	2.04	2.14		
Tom Reed	Los Angeles	*40	*35	*35	Dec., 1919	0.02
Tough-Oakes	Toronto	*59½	*56½	*59		
United Eastern	N. Y. Curb	*48	*48	*48	July, 1924	0.05
Vipond Cons.	Toronto	1.27	1.13	1.24		
Wright-Hargreaves	Toronto	6.65	6.40	6.55	Se.15, Oc.1 QEx	0.05
GOLD AND SILVER						
Black Oak	N. Y. Curb			*81		
Carnegie Metals	Pittsburgh	19⅞	17⅛	19½		
Con. Cortez	N. Y. Curb			*8		
Con. Virginia	San Francisco	16⅛	6½	14½		
Continental Mines	N. Y. Curb			75		
Dolores Esperanza	N. Y. Curb	*60	*58	*60	July, 1923	0.05
Premier Gold	N. Y. Curb	2 5/16	2⅛	2⅛	Se.18, Oc.3	0.08
Tonopah Belmont	N. Y. Curb	1.25	*68	1.00	Se.15, Oc.1	0.05
Tonopah Divide	N. Y. Curb			*23	Oct., 1923	0.10
Tonopah Extension	N. Y. Curb	1⅜	1 7/16	1⅜	Mh.11, Ap.1, Q	0.05
Tonopah Mining	N. Y. Curb	4¼	4⅛	4⅛	Se.30, Oc.21	0.07½
Unity Gold	N. Y. Curb	*40	*40	*40		
West End Consol.	N. Y. Curb			*30	Mar., 1923	0.05
Yukon Gold	N. Y. Curb	*74	*35	*60	June, 1918	0.02

Stock	Exch.	High	Low	Last	Last	Div.
SILVER						
Alvarado	N. Y. Curb	*75	*75	*75	Oct., 1920	0.50
Beaver Consol	Toronto	*48	*44½	*47¾	May. 1920	0.03
Castle-Trethewey	Toronto	1.43	1.40	1.42		
Coniagas	Toronto	2.20	1.80	2.00	May, 1924	0.12½
Keeley	Toronto	1.57	1.49	1.56	Au.31,Se.15RX	0.12
Kerr Lake	N. Y. Curb	1¼	1	1⅛	Oc. 1, Oc.15 Q	0.12½
La Rose	Toronto	*43	*38½	*40½	Apr., 1922	0.10½
Lorrain Trout Lake	Toronto	*85	*85	*85	Jy. 2, Jy. 15	0.05
McKinley-Dar.-Sav.	Toronto	*25½	*20¼	*24	Oct., 1920	0.03
Mining Corp. Can.	Toronto	3.15	2.98	3.12	Jy.1, Jy.15	0.12½
Nipissing	N. Y. Curb	4⅜	4⅜	4⅜	Se.30, Oc.20, Q	0.15
Ontario Silver	New York	11	10⅛	11	Jan., 1919	0.50
Temiskaming	Toronto	*17	*12	*15	Jan., 1920	0.40
SILVER-LEAD						
Ahumada	New York	9	8⅛	8⅞	Se.19,Oc.2,QEx.	0.25
Bingham Mines	Boston	60	57	57	Se.19, Se.30 Q	0.50
Cardiff M. & M.	Salt Lake	*85	*60	*85	De.16, No.18	0.10
Chief Consol.	Salt Lake	3.30	3.30	3.30	Oc. 10, No. 1	0.10
Columbus Rexall	Salt Lake	2.00	1.25	2.00	Aug., 1923	0.05
Erupcion	Boston Curb	2⅛	2	2⅛	Se.19,Oc.2,QEx.	0.15
Federal M. & S.	New York	60	33⅛	52	Fe.26, Mh.15 Q	1.75
Federal M. & S., pfd.	New York	92	76	84	Au.25, Se.15	1.75
Hecla Mining	N. Y. Curb	17¾	17½	17⅝	Au.15, Se.15 Q	0.50
Iron Blossom Con.	Salt Lake			*39	Oc.25, 1924	0.01½
Iron King Mining	Salt Lake	*49	*46	*49		
Keystone Mining	Salt Lake	*70	*67	*67	Au.12, Au.26	0.07½
Lucky Jim	Spokane	12¾	11	11⅞		
Mammoth Mining	Salt Lake	3.02½	2.92½	2.92½	My.15, My.25	0.10
Marsh Mines	Spokane	*10¼	*8⅞	*9⅛	Se.15, Oc.1	0.15
Park Utah	Salt Lake	8.50	7.80	8.50	Se.15, Oc.1	0.15
Prince Consol.	Salt Lake	*4	*2⅛	*3		
Silver King Coal.	Salt Lake	10.25	10.00	10.25	Se.20,Oc.1, Q	0.25
Silversmith	Spokane	*3¼	*29	*29¼	Oc.1, Oc.10	0.01
Tamarack-Custer	Spokane	*38	*34	*35	Sept., 1924	0.25
Tintic Standard	Salt Lake	15.00	14.25	14.87½	Se.22, Se.29	0.40
Utah-Apex	Boston	6⅞	5⅝	6⅛	Oc.3, Oc.15, Q	0.35
Western Utah Copper	N. Y. Curb			*10		
IRON						
Bethlehem Steel	New York	49⅜	47	47	July, 1924	1.25
Colorado Fuel & Iron	New York	42⅜	40½	40⅜	May, 1921	0.75
Gt. North'n Iron Ore	New York	33⅜	31⅜	32	Ap.11, Ap.30	1.00
Inland Steel	New York	45⅝	43	43	No.13, De.1 Q	0.62½
Mesabi Iron	N. Y. Curb	1⅞	1⅛	1⅞		
Replogle Steel	New York	17	15½	15⅝		
Republic I. & S.	New York	56⅜	53⅝	54⅝	May, 1921	1.50
Republic I. & S. pfd.	New York	94	93	94	Se.15, Oc.1, Q	1.75
Sloss-Sheffield S. & I.	New York	117½	111½	115⅝	Se.10, Se.21 Q	1.50
Sloss-Shef. S.&I. pfd.	New York	99½	97⅛	98	Se.21, Oc.1, Q	1.75
U. S. Steel	New York	130⅛	127⅜	128	No.28, De.30 XQ	1.75
U. S. Steel pfd.	New York	126½	125½	126⅛	No. 3, No. 28, Q	1.75
Virginia I. C. & C.	New York	39¾	39	39¾	Jan., 1924	1.50
Virginia I.C.&C.pfd	New York			70	Jn.20, Jy.2,	2.50
VANADIUM						
Vanadium Corp.	New York	33⅜	31¼	32⅛	No.2, No.16 Q	0.75
ASBESTOS						
Asbestos Corp.	Montreal	97⅞	94	94½	Se.30, Oc.15 Q	1.50
Asbestos Corp., pfd.	Montreal	113¼	111	112½	Se.30, Oc.15, Q	1.50
SULPHUR						
Freeport Texas	New York	22¼	20	20	Nov., 1919	1.00
Texas Gulf	New York	117¼	114½	115½	Au.31, Se.15, Q	2.00
DIAMONDS						
De Beers Consol.	New York	26⅛	25½	26½	Jy.27, Au.30	0.97
PLATINUM						
So. Am. Gold & P.	N. Y. Curb	5⅜	4⅛	5¾		
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	57⅝	54½	55	No. 20, De. 1, Q	1.00
Amer. Metal pfd.	New York	118	117¼	117¼	No. 21, De. 1, Q	1.75
Amer. Sm. & Ref.	New York	118½	115	117⅜	Oc.16, No.2, Q	1.75
Amer. Sm.&Ref.pfd.	New York	115	114⅜	115	No.6, De.1, Q	1.75
Consol. M. & S.	Montreal	168	150½	164½	Jn.30, Jy.15	0.75
Federated Metals	N. Y. Curb	25⅛	25⅛	25⅜		
Newmont Mining	N. Y. Curb	44¾	44	44¾	Oc.1, Oc.15	0.60
Southwest Metals	N. Y. Curb			1		
U. S. Sm. R. & M.	New York	48½	46	47⅞	Oc.7, Oc.15, Q	0.75
U.S. Sm. R.&M.pfd.	New York	47⅞	46½	47	Oc.7, Oc.15, Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange and George H. Watson & Co.; Colorado Springs, Colorado Springs Stock Exchange.

LONDON QUOTATIONS, WEEK ENDED OCT. 24, 1925

	High	Low	Last	Date	Per Cent
Aramayo Mines (25 frs.)	88/9	84/4½	87/6	Nov. 1925	5(c)
British Platinum	8/9	8/1½	8/9	Feb. 1925	2½
Burma Corpn. (10 rupees)	19/3	18/6	18/6	Aug. 1925	6 annas.
Bwana M'Kubwa	7/1½	6/7½	7/—		
Camp Bird	4/10½	3/6	4/7½		
El Oro	5/10½	5/6	5/9	Nov. 1924	2½
Esperanza	1/—	—/10½	1/—		
Frontino & Bolivia	9/9	9/—	9/—	July 1925	3¾
Mexican Corporation	15/9	14/9	15/6		
Mexican Mines of El Oro	42/6	40/—	40/—	June 1925	10*
Nechi (pref. 10s.)	1/3	1/—	1/—	1921-22	25
Oroville Dredging	4/—	3/6	3/6	Dec. 1923	3¾
Ouro Preto	3/—	2/6	2/9	May 1925	2½
St. John del Rey	14/1½	13/6	14/—	June 1925	6¼
San Francisco Mines	27/1½	26/3	26/3	June 1925	15
Santa Gertrudis	16/6	13/10½	16/3	July 1920	5
Selukwe (2s. 6d.)	10/9	10/—	10/3	April 1917	6¾
S. American Copper	7/3	5/9	7/—	Nov. 1917	75
Tanganyika	49/3	45/—	47/6	Sept. 1925	5
Tomboy	4/—	3/9	4/—	Sept. 1925	5
Union Minière du Haut-Katanga (Brussels) 100 Fr.	6.675	6.575	6.655	July 1925	150(b)

* Free of British income tax. (b) Belgian francs. (c) Swiss francs.